ACADEMIC REGULATIONS,

COURSE STRUCTURE

AND

DETAILED SYLLABUS

BRANCH NAME

For

B.Tech FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2016-17)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533003, ANDHRA PRADESH, INDIA.

ACADEMIC REGULATIONS (R16) FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2016-17 onwards

1. **Award of B. Tech. Degree**

   A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:

   1. A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years
   2. The candidate shall register for 180 credits and secure all the 180 credits.

2. **Courses of Study**

   The following courses of study are offered at present as specializations for the B. Tech. Courses:

S. No	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering
05	Computer Science and Engineering
06	Information Technology
07	Petro Chemical Engineering
08	Chemical Engineering
09	Electronics and Instrumentation Engineering
10	Aeronautical Engineering
11	Automobile Engineering
12	Bio Technology
13	Electronics and Computer Engineering
14	Mining Engineering
15	Petroleum Engineering
16	Metallurgical Engineering
17	Agricultural Engineering

3. **Distribution and Weightage of Marks**

(i) The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for theory subject and 75 marks for practical subject. The project work shall be evaluated for 200 marks.

(ii) For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End - Examinations.

(iii) For theory subjects, during the semester there shall be 2 tests. The weightage of Internal marks for 30 consists of Descriptive – 15, Assignment - 05 (Theory, Design, Analysis, Simulation, Algorithms, Drawing, etc. as the case may be and for Physics Virtual Labs to be consider as Assignments) Objective -10 (Conducted at College level with 20 Multiple choice question with a weightage of ½ Mark each). The objective examination is for 20 minutes duration. The subjective examination is for 90 minutes duration conducted for 15 marks. Each subjective type test question paper shall contain **3 questions** and all questions need to be answered. The Objective examination conducted for 10 marks and subjective examination conducted for 15 marks are to be added to the assignment marks of 5 for finalizing internal marks for 30.

Internal Marks can be calculated with 80% weightage for best of the two Mids and 20% weightage for other Mid Exam As the syllabus is framed for 6 units, the 1st mid examination (both Objective and Subjective) is conducted in 1-3 units and second test in 4-6 units of each subject in a semester.

(iv) The end semester examination is conducted covering the topics of all Units for 70 marks. End Exam Paper: Part-A 1st Question is mandatory covering all the syllabus which contains seven 2 marks questions for 14 marks with atleast 2 marks of question for each of the six units and in Part-B 4 Questions out of 6 Questions are to be answered with each carrying 14 marks . Part-A & Part-B put together gives for 70 marks.

(v) For practical subjects there shall be continuous evaluation during the semester for 25 internal marks and 50 end examination marks. The internal 25 marks shall be awarded as follows: day to day work - 10 marks, Record-5 marks and the remaining 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner.

(vi) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (20 marks for day – to – day work, and 10 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester and the Marks for 10 can be calculated with 80% weightage for best of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.

(vii) For the seminar, Each student has to be evaluated based on the presentation of any latest topic with report of 10-15 pages and a ppt of min 10 slides. The student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

(viii) Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.

(ix) Laboratory marks and the internal marks awarded by the College are not final. The marks are subject to scrutiny and scaling by the University wherever felt desirable. The internal and laboratory marks awarded by the College will be referred to a Committee. The Committee shall arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the University norms and shall be produced to the Committees of the University as and when they ask for.

4. **Attendance Requirements**

1. A student is eligible to write the University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
2. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee
3. Shortage of Attendance below 65% in aggregate shall not be condoned.
4. A student who is short of attendance in semester may seek re-admission into that semester when offered within 4 weeks from the date of the commencement of class work.
5. Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.
6. A stipulated fee shall be payable towards condonation of shortage of attendance.
7. A student will be promoted to the next semester if he satisfies the (i)attendance requirement of the present semester and (ii) minimum required credits.
8. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

5. **Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.4.

5.1 A student is deemed to have satisfied the minimum academic requirements if he has **earned the credits allotted to each theory/practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the internal marks and end semester examination marks.**

5.2 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

5.3 A student will be **promoted from II year to III year** if he fulfills the academic requirement **of 40% of the credits up to either II year I semester or II year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.**

5.4 A student shall be **promoted from III year to IV year** if he fulfils the academic requirements of **40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.**

5.5 A student shall register and put up minimum attendance in all 180 credits and earn all 180 credits.

6. Course Pattern

1. The entire course of study is for four academic years, all the years are on semester pattern.
2. A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.
3. When a student is detained for lack of credits / shortage of attendance, he may be re-admitted into the same semester / year in which he has been detained. However, the academic regulations under which he was first admitted shall continues to be applicable to him.

7. CGPA

Marks Range Theory (Max – 100)	Marks Range Lab (Max – 75)	Letter Grade	Level	Grade Point
≥ 90	≥ 67	>90	Outstanding	10
≥80 to <90	≥60 to <67	90-80	Excellent	9
≥70 to <80	≥52 to <60	80-70	Very Good	8
≥60 to <70	≥45 to <52	70-60	Good	7
≥50 to <60	≥37 to <45	60-50	Fair	6
≥40 to <50	≥30 to <37	50-40	Satisfactory	5
			Pass	4
<40	<30	<40	Fail	0
			Absent	0

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Averagae. (SGPA) and Cumulative Grade Point Average (CGPA):

The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e

SGPA (Si) = ∑ (Ci X Gi) / ∑ Ci

Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

Computation of CGPA

- The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.

  CGPA = ∑ (Ci X Si) / ∑ Ci

Where Si is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester.

- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- Equivalent Percentage = (CGPA – 0.75) / x 10

8. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75 with no subjects	**From the CGPA secured from 180 Credits.**
First Class	≥ 6.75 with subjects failures	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

9. Minimum Instruction Days

The minimum instruction days for each semester shall be 90 working days.

10. There shall be no branch transfers after the completion of the admission process.
11. There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

12. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

13. TRANSITORY REGULATIONS

1. Discontinued or detained candidates are eligible for readmission as and when next offered.
2. The readmitted students will be governed by the regulations under which the candidate has been admitted.
3. (a) In case of transferred students from other Universities, the credits shall be transferred to JNTUK as per the academic regulations and course structure of the JNTUK.
   (b) The students seeking transfer to colleges affiliated to JNTUK from various other Universities / Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. In addition, the transferred candidates have to pass the failed subjects at the earlier instiute with already obtained sessional marks to be conducted by JNTUK.

14. General

1. Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
2. The academic regulation should be read as a whole for the purpose of any interpretation.
3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
4. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

ACADEMIC REGULATIONS (R16) FOR B. TECH. (LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Tech. from the Academic Year 2017-18 onwards

1 **Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:

1.1 A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years.

1.2 The candidate shall register for 132 credits and secure all the 132 credits.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech.

3. **Promotion Rule**

A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year if he fulfils the academic requirements of 40% of the credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

4. **Award of Class**

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	**CGPA to be secured**	**From the CGPA secured from 132 Credits from II Year to IV Year**
First Class with Distinction	≥ 7.75 with no failures	
First Class	≥ 6.75 to <7.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

The marks obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

5. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)
For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

Prohibition of Ragging in Educational Institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

KAKINADA-533003, Andhra Pradesh (India)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA-533003, Andhra Pradesh (India)
For Constituent Colleges and Affiliated Colleges of JNTUK
For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

Jawaharlal Nehru Technological University Kakinada
For Constituent Colleges and Affiliated Colleges of JNTUK

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

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POTTI SRIRAMULU CHALAVADI MALLIKHARJUNA RAO
COLLEGE OF ENGINEERING & TECHNOLOGY
Approved by AICTE, NEW DELHI and Affiliated to JNTU, Kakinada.
Sponsored by : SKPVV Hindu High Schools Committee, Estd : 1906.
D.No. 7-3-6/1, Raghava Reddy Street, Kotha pet, Vijayawada - 520 001.
Voice : 0866-2423442, 91777 77855, Fax: 0866-2423443, E-mail: principal@pscmr.ac.in., Web: www.pscmr.as.in

R13 DISTRIBUTION AND WEIGHTAGE OF MARKS

(i) The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for theory subject and 75 marks for practical subject. The project work shall be evaluated for 200 marks.

(ii) For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End - Examinations.

(iii) For theory subjects, during the semester there shall be 2 tests. The weightage of Internal marks for 30 consists of Descriptive – 15, Assignment - 05 (Theory, Design, Analysis, Simulation, Algorithms,Drawing, etc. as the case may be)

Objective -10 (Conducted at College level with 20 Multiple choice question with a weightage of ½ Mark each). The objective examination is for 20 minutes duration. The subjective examination is for 90 minutes duration conducted for 15 marks. Each subjective type test question paper shall contain **3 questions** and all questions need to be answered. The Objective examination conducted for 10 marks and subjective examination conducted for 15 marks are to be added to the assignment marks of 5 for finalizing internal marks for 30. The best of the two tests will be taken for internal marks. As the syllabus is framed for 6 units, the

1st mid examination (both Objective and Subjective) is conducted in 1-3 units and second test in 4-6 units of each subject in a semester.

(iv) The end semester examination is conducted covering the topics of all Units for 70 marks. Part – A contains a mandatory question (Brainstorming / Thought provoking / case study) for 22 marks. Part – B has 6 questions (One from each Unit). The student has to answer 3 out of 6 questions in Part – B and carries a weightage of 16 marks each.

(v) For practical subjects there shall be continuous evaluation during the semester for 25 internal marks and 50 end examination marks. The internal 25 marks shall be awarded as follows: day to day work – 10 marks, Record-5 marks and the remaining 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner.

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Kothapet, VIJAYAWADA-520 001

(vi) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (20 marks for day – to – day work, and 10 marks

for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests. Electrical and Electronics Engineering

(vii) For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

(viii) Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.

(ix) Laboratory marks and the internal marks awarded by the College are not final. The marks are subject to scrutiny and scaling by the University wherever felt desirable. The internal and laboratory marks awarded by the College will be referred to a Committee. The Committee shall arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the University norms and shall be produced to the Committees of the University as and when they ask for.

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INTERNAL EXAM QUESTION PAPERS

P.S.C.M.R.COLLEGE OF ENGINEERING AND TECHNOLOGY
II B.TECH-II SEM – 2nd MID EXAMINATION
CIVIL ENGINEERING DEPARTMENT
Hydraulics and Hydraulic Machinery

Duration: 1hr 30 min **Date: 20/03/2018**

Answer all the questions

1) A Jet of water having a velocity of 40m/sec strikes a curved vane which is moving with a velocity of 20m/sec. The jet makes an angle of 30 degrees with the direction of motion of vane at inlet and leaves an angle of 90 degrees to the direction of motion of vane at outlet. Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock. Also find the work done. (CO1)
2) (a) Distinguish between Impulse Turbine and Reaction Turbine. Give the typical Inlet and Outlet Velocity Triangles for Pelton, Francis and Kaplan Turbines.
   (b) Define Specific Speed of a turbine and derive the expression for it. (CO2)
3) (a) Explain the various components of a Centrifugal Pump with a simple and neat sketch.
   (b) What do you understand by Indicator Diagram of a Reciprocating Pump? Show the effect of Acceleration Head and Frictional Loss Head on it. (CO3)

CO1: Understanding of basics of turbo machinery and solving problems on them.
CO2: Distinguishing the turbines and their working.
CO3: knowing the concepts of working of pumps

CO stands for Course Outcome.

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College of Engineering & Technology
Kothapet, VIJAYAWADA-520 001

Code No: RT31012 **R13** SET - 1

III B. Tech I Semester Regular/Supplementary Examinations, October/November -2017
STRUCTURAL ANALYSIS – II
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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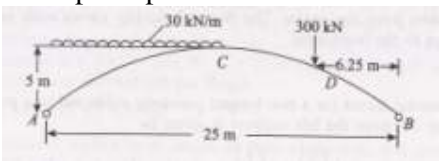
PART –A

1 a) Define Eddy's Theorem. [4M]
b) Write the formula of Portal frame method. [3M]
c) What is difference between Cable and Suspension bridge? [4M]
d) List the important steps in the moment distribution method? [4M]
e) What is rotational factor? [3M]
f) What is kinematic indeterminacy? [4M]

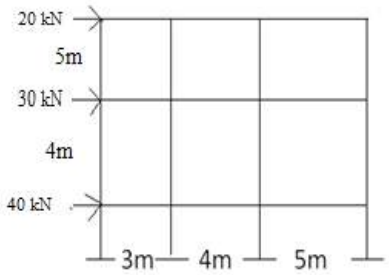
PART -B

2 a) A two hinged parabolic arch is loaded as shown in the figure below. Compute the horizontal thrust from the first principles. [8M]



b) Differentiate between Three Hinged Arches and Two Hinged Arches. [8M]

3 a) Analyse the frame shown in the figure by Portal Frame method. [8M]



4 Analysis the continuous beam shown in figure by the moment distribution method. Draw the bending moment diagram and shear force diagram. The beam is of uniform section. [16M]

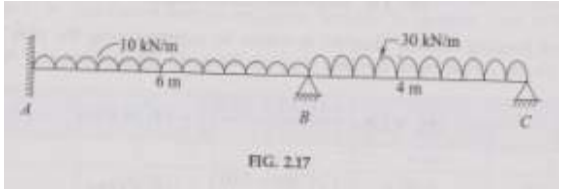


FIG. 2.17
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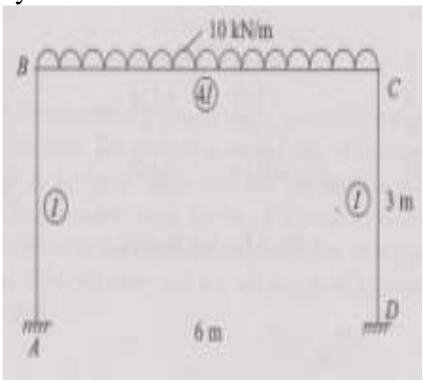
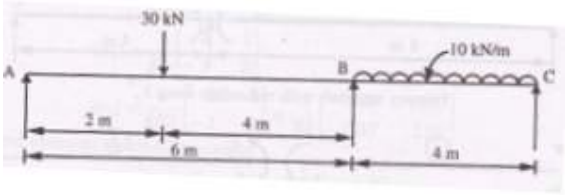
Code No: RT31012 **R13** SET - 1

5 Analyze the given frame by Kani's method. Sketch the bending moment diagram. [16M]



6 Analyse the continuous beam shown in figure by the flexibility method and draw the bending moment diagram. [16M]



7 Two hinged girders of a suspension bridge have a span of 100m,the dip of the supporting cable being 10m.If the girder is subjected to two point loads of 300kN and 100kN at distances of 20m and 80m from the left end , find the S.F and B.M for the girder at 25m from the left end. Find also the maximum tension in the cable. [16M]

*****

Code No: RT31012 **R13** SET - 2

III B. Tech I Semester Regular/Supplementary Examinations, October/November -2017

STRUCTURAL ANALYSIS – II

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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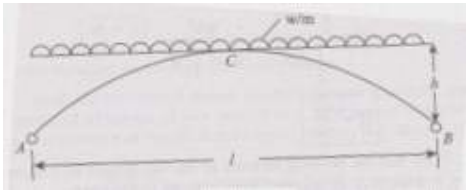
PART –A

1 a) Write about fixed arches. [3M]
b) What are the different characteristics of cable? [4M]
c) State two assumptions made in the analysis of Cantilever method? [4M]
d) Draw the bending moment diagrams for a portal frame of two bay two storey with and without sway. [4M]
e) What is displacement factor? [3M]
f) Name the unknown to be determined in the stiffness method? [4M]

PART -B

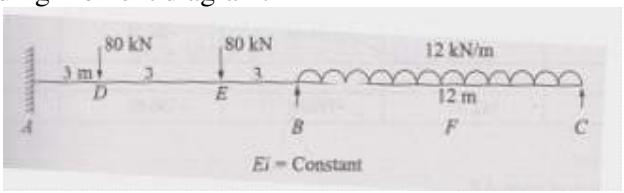
2 a) A symmetrically loaded arch with uniformly distributed load throughout the span. Calculate the horizontal thrust. [4M]



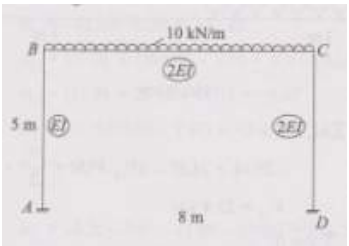
b) What is normal thrust and redial shear in three hinged arch? [8M]

3 a) Analyze a multistoried building of two bays and two span of height 5m with a span length of 5m each for a lateral load of 50kN at the top bay of the portal frame by Portal method. [16M]

4 Analyse the continuous beam by moment distribution method. Draw the shear force diagram and bending moment diagram. [16M]



5 Analyse the portal frame shown in figure by Kani's method and draw the bending moment diagram. [16M]



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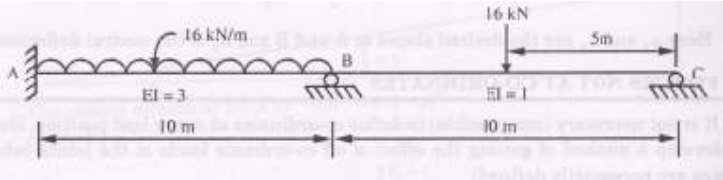
6 Analyse the continuous beam in figure by flexibility method. [16M]



7 A cable is used to support five equal and equidistant loads over a span of 50m. Find the length of the cable required and its sectional area if the safe tensile stress is 200 N/mm^2. The central dip is 4.0m and loads are 5kN each. [16M]

*****

Code No: RT31012 **R13** SET - 3

III B. Tech I Semester Regular/Supplementary Examinations, October/November -2017

STRUCTURAL ANALYSIS – II

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

~~~~~~

PART –A

1 a) Give the example of an statically indeterminate arch. [3M]

b) State two assumptions made in the analysis of cables. [4M]

c) State two assumptions made in the analysis of Portal frame method? [4M]

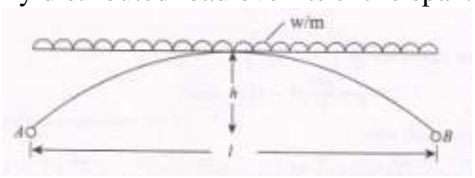
d) Define distribution factor at a joint. [3M]

e) Mention the characteristics of stiffness matrix. [4M]

f) What are the steps involved in Kani's method? [4M]

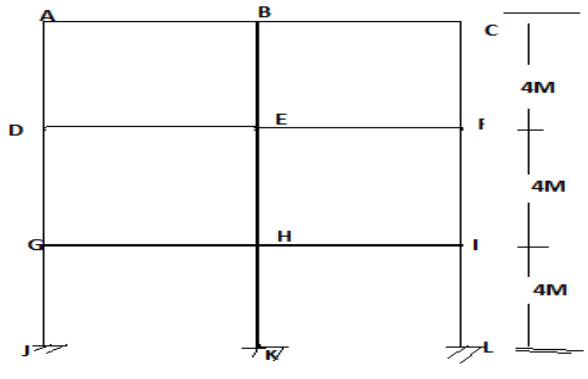
PART -B

2 a) Prove that the bending moment in the two hinged arch is zero everywhere if it is carrying a uniformly distributed load over its entire span. [8M]



b) State and prove Eddy's Theorem. [8M]

3 Analyse the portal frame shown below by cantilever method which carries a lateral load of 40kN at the top bay of the frame and 30kN at middle bay of the frame [16M]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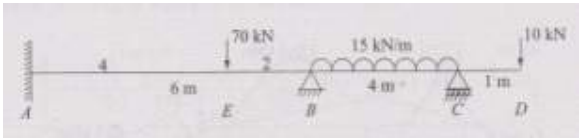
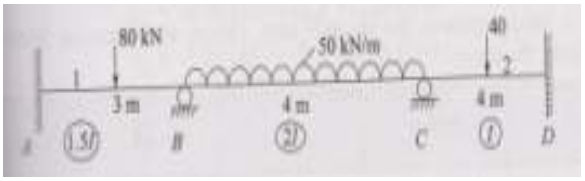
Code No: RT31012 **R13** SET - 3

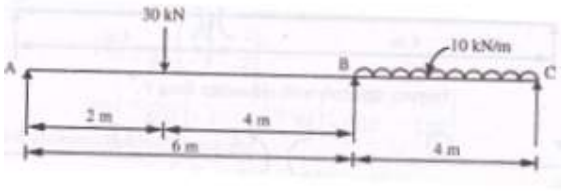
4 Analyse the beam shown in figure by the moment distribution method. Support B sinks by 10 mm. E = 200 kN/mm^2. I = 4000 × 10^4 mm^4. Draw BMD and SFD. [16M]



5 Determine the support moments for the continuous beam shown in figure by Kani's method. The relative I values are indicated along the member in each span. EI is constant. Sketch the BMD and SFD. [16M]



6 Analyse the continuous beam shown in figure by the Stiffness method and draw the bending moment diagram. [16M]



7 A light cable 24m long is supported at two ends at the same level. The supports are 20m apart. The cable supports three loads 12, 14 and 16N dividing the 20m distance in four equal parts. Find the shape of the string and the tension in various portions. [16M]

*****

Code No: RT31012 **R13** SET - 4

III B. Tech I Semester Regular/Supplementary Examinations, October/November -2017

STRUCTURAL ANALYSIS – II

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1 a) State and prove Eddy's theorem. [3M]

b) Define arch and how it differs from beam? [4M]

c) State two assumptions made in the analysis of Portal frame method? [4M]

d) Derive an expression for distribution factor. [3M]

e) Mention the characteristics of stiffness matrix. [4M]

f) Derive an expression for shear force and bending moment at any section for a three hinged stiffening girder. [4M]

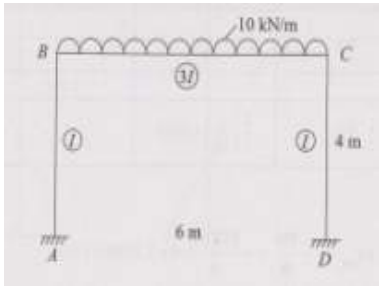
PART -B

2 a) A three hinged parabolic arch of span 30 m and rise 5m carries a uniformly distributed load of 30 kN per m on the whole span and a point load of 90kN at a distance of 5m from the right end. Find the horizontal thrust. Also, find the bending moment, normal thrust and radial shear at a section 5m from the left end. [10M]

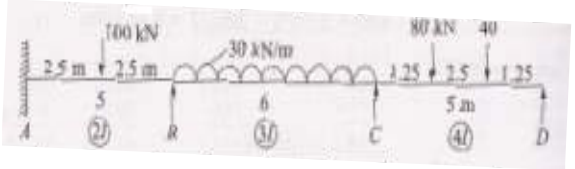
b) Determine the horizontal Thrust for a Three Ringed arch. [6M]

3 Analyze a multistoried building of two bays and two span of height 6m with a span length of 5m each for a lateral load of 60kN at the top bay of the portal frame and 50kN at the middle bay of the portal frame. Use Cantilever method . [16M]

4 Analyse the given frame by the moment distribution method. Sketch the bending moment diagram. [16M]



5 Analyse the three span continuous beam using Kani's method. The values of second moment area of each span are indicted along the members. EI is constant. Calculate the end moments. [16M]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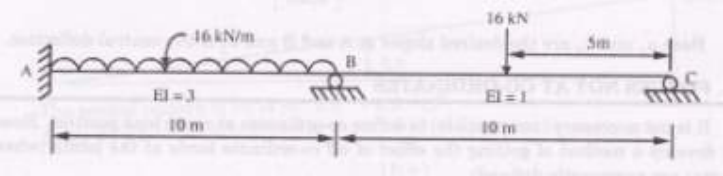
Code No: RT31012 **R13** SET - 4

6 Analyse the continuous beam in figure by stiffness method. [16M]



7 A light cable 26m long is supported at two ends at the same level. The supports are 24m apart. The cable supports three loads 7, 9 and 11 N dividing the 24m distance in to four equal parts. Find the shape of the string and the tension in various portions. [16M]

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POTTI SRIRAMULU CHALAVADI MALLIKHARJUNA RAO
COLLEGE OF ENGINEERING & TECHNOLOGY
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R16 DISTRIBUTION AND WEIGHTAGE OF MARKS

Jntu kakinada B.Tech R16 academic regulations, JNTUK R16 Regulation b.tech academic regulations, academic regulations for Lateral Entry Scheme.

Academic Regulations R16 for B.Tech. (Regular)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2016-17 onwards.

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B. Tech. Degree if he fullls the followingacademic regulations.

(a) A student will be declared eligible for the award of the B. Tech. Degree if he Pursued a course of study for not less than four academic years and not more than eight academic years.

(b) The candidate shall register for 180 credits and secure all the 180 credits.

2. Courses of study

The following courses of study are oered at present as specializations for the B. Tech. Courses with English as medium of Instruction.

S. No.	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering 03 Mechanical Engineering
04	Electronics and Communication Engineering 05 Computer Science Engineering
06	Chemical Engineering
07	Electronics and Instrumentation Engineering
08	08 Bio – Medical Engineering

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09 Information Technology

10 Electronics and Computer Engineering

11 Aeronautical Engineering

12 Bio – Technology

13 Auto mobileEngineering

14 Petro Chemical Engineering

15 Mining Engineering

16 Petroleum Technology

17 Metallurgical Engineering

18 Agricultural Engineering

And any other course as approved by the authorities of the University from time to time.

3. Distribution and Weightage of Marks

(i) The performance of a student in each semester shall be evaluated subject – wise with a maximum of 100 marks for theory and 75 marks for practical subject. The project work shall be evaluated for 200 marks.

(ii) For theory subjects the distribution shall be 30 marks for Internal Evaluation And 70 mark for the End – Examinations.

(iii.) For theory subjects, during the semester there shall be 2 tests. The weightage of Internal marks for 30 consists of Descriptive – 15, Assignment – 05 (Theory, Design, Analysis, Simulation, Algorithms, Drawing, etc. as the case may be and for Physics, Virtual Labs to be considered as Assignments) Objective -10 (Conducted at College level with 20 Multiple choice question with a weightage of ½ Mark each). The objective examination is for 20 minutes duration.

The subjective examination is for 90 minutes duration conducted for 15 marks. Each subjective type test question paper shall contain 3 questions and all questions need to be answered. The Objective examination conducted for 10 marks and subjective examination conducted for 15 marks are to be added to the assignment marks of 5 for nalizing internal marks for 30. Internal Marks can be calculated with 80% weightage for best of the two Mids and 20% weightage for other Mid Exam As the syllabus is framed for 6 units, the 1st mid examination (both Objective and Subjective) is conducted in 1-3 units and second test in 4-6 units of each subject in a semester.

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The end semester examination is conducted covering the topics of all Units for 70 marks. End Exam Paper: Part-A 1st Question is mandatory covering all the syllabus which contains seven 2 marks questions for 14 marks with at least 2 marks of question for each of the six units And in art- B 4 Questions out of 6 Questions are to be answered with each carrying 14 marks. Part-A & Part-B put together gives for 70 marks.

(iv) For practical subjects there shall be continuous evaluation during the semester for 25 internal marks and 50 end examination marks. The internal 25 marks shall be awarded as follows: day to day work – 10 marks, Record-5 marks and the remaining 10 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner.

(v) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (20 marks for day – to – day work, and 10 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester and the Marks for 10 can be calculated with 80% weightage for best of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work. (vii.) For the seminar, each student has to be evaluated based on the presentation of any latest topic with report of 10-15 pages and a ppt of min 10 slides. The student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar. Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee. Laboratory marks and the internal marks awarded by the College are not nal. The marks are subject to scrutiny and scaling by the University wherever felt desirable. The internal and laboratory marks awarded by the College will be referred to a Committee. The Committee shall arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective departments as per the University norms and shall be produced to the Committees of the University as and when they ask for.

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INTERNAL EXAM QUESTION PAPERS

P.S.C.M.R.COLLEGE OF ENGINEERING AND TECHNOLOGY
II B.TECH-II SEM – 2nd MID EXAMINATION
CIVIL ENGINEERING DEPARTMENT
Hydraulics and Hydraulic Machinery

Duration: 1hr 30 min **Date: 20/03/2018**

Answer all the questions

1) A Jet of water having a velocity of 40m/sec strikes a curved vane which is moving with a velocity of 20m/sec. The jet makes an angle of 30 degrees with the direction of motion of vane at inlet and leaves an angle of 90 degrees to the direction of motion of vane at outlet. Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock. Also find the work done. (CO1)
2) (a) Distinguish between Impulse Turbine and Reaction Turbine. Give the typical Inlet and Outlet Velocity Triangles for Pelton, Francis and Kaplan Turbines.
   (b) Define Specific Speed of a turbine and derive the expression for it. (CO2)
3) (a) Explain the various components of a Centrifugal Pump with a simple and neat sketch.
   (b) What do you understand by Indicator Diagram of a Reciprocating Pump? Show the effect of Acceleration Head and Frictional Loss Head on it. (CO3)

CO1: Understanding of basics of turbo machinery and solving problems on them.
CO2: Distinguishing the turbines and their working.
CO3: knowing the concepts of working of pumps

CO stands for Course Outcome.

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Code No: R1621013 **R16** SET - 1

II B. Tech I Semester Regular Examinations, October/November - 2017
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Define Poisson' Ratio. (2M)
   b) What are the different types of beams? Differentiate between a cantilever and a simply ported beam. (3M)
   c) Define bending stress in a beam. (2M)
   d) What do you mean by shear stresses in beams? (2M)
   e) What are the different methods of finding slope and deflection of a cantilever? (2M)
   f) Differentiate between Thin and Thick Cylinder. (3M)

PART -B

2. a) A straight circular rod tapering from diameter 'D' at one end to a diameter 'd' at the other end is subjected to an axial load 'P'. Obtain an expression for the elongation of the rod. (7M)
   b) Derive strain energy equation for gradual loading. (7M)

3. A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500N/m over the entire length. Draw S.F. and B.M diagrams and find the point of contraflexure, if any. (14M)

4. a) What are the assumptions of simple bending? (4M)
   b) A timber cantilever 200 mm wide and 300 mm deep is 3 m long. It is loaded with a U.D.L of 3kN/m over the entire length. A point load of 2.7 kN is placed at the free end of the cantilever. Find the maximum bending stress produced. (10M)

5. Derive the stress distribution for circular section & plot shear stress distribution. (14M)

6. a) Find the expression for the slope and deflection of a cantilever of length L which carries a uniformly distributed load over a length 'a' from the fixed end by Moment area method. (8M)
   b) Prove that the relation that $M = EI\frac{d^2y}{dx^2}$ where M= Bending moment, E= young's modulus, I = M.O.I. (7M)

7. Derive Lame's formulae for thick cylinder. (14M)

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II B. Tech I Semester Regular Examinations, October/November - 2017
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) Derive volumetric strain. (2M)
b) What are the different types of loads acting on a beam? Differentiate between a point load and uniformly distributed load. (3M)
c) Define Neutral Axis. (2M)
d) Write shear stress equation (2M)
e) What are the important points in finding slope and deflection by Macaulay's Method? (2M)
f) What do you mean by thick compound cylinder? (3M)

PART -B

2. a) A rod, whose ends are fixed to rigid supports, is heated so that rise in temperature is T^0C.Prove that the thermal strain and thermal stresses set up in the rod are given by, Thermal strain = α.T and
Thermal stress = α.T.E
Where α = Co-efficient of linear expansion. (7M)
b) Derive strain energy equation for sudden loading. (7M)

3. A simply supported beam of length 8 m rests on supports 5 m apart, the right hand end is overhanging by 2 m and the left hand end is overhanging by 1m. The beam carries a uniformly distributed load of 5 kN/m over the entire length. It also carries two point loads of 4 kN and 6 kN at each end of the beam. The load of 4 kN is at the extreme left of the beam. Whereas the load of 6 kN is at the extreme right of the beam. Draw S.F and B.M diagrams for the beam and find the points of contraflexure. (14M)

4. a) How would you find the bending stress in unsymmetrical section? (7M)
b) A cast iron pipe of external diameter 60mm, internal diameter of 40mm, and of length 5 m is supported at its ends. Calculate the maximum bending stress induced in the pipe if it carries a point load of 100 N at its centre. (8M)

5. Derive the Stress distribution for 'T'section and plot shear stress diagram. (14M)

6. a) A cantilever of length 3 m carries a uniformly distributed load of 15kN/m over a length of 2 m from the free end. If $I=10^8$ $mm^4$and E=2 x 10^5 N/mm^2, find:
(i) Slope at the free end and (ii) Deflection at the free end. (8M)
b) Find an expression for the slope at the supports of a simply supported beam, carrying a point load at the centre. (7M)

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7. a) Derive formulae for longitudinal and circumferential stresses of Thin cylinder. (10M)

   b) Differentiate between thin and thick cylinders. (4M)

Code No: R1621013 **R16** SET - 3

II B. Tech I Semester Regular Examinations, October/November - 2017
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Define Resilience (2M)
   b) Define point of contra flexure. (3M)
   c) Calculate section Modulus for circular function (2M)
   d) Define Shear centre. (2M)
   e) What is Moment area method? (2M)
   f) Explain about wire wound cylinders. (3M)

PART -B

2. a) A mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter of 25 mm. The ends of the tube and rods are brazed together, and the composite bar is subjected to an axial pull of 40 kN. If *E* for steel and copper is 200 GN/m^2 and 100 GN/m^2 respectively, find the stresses developed in the rod and tube. Also find the extension of the rod. (7M)
   b) Derive the strain energy equation for impact loading. (7M)

3. a) A simply supported beam of length 5 m, carries a uniformly distributed load of 100 N/m extending from the left end to a point 2 m away. There is also a clockwise couple of 1500 Nm applied at the centre of the beam. Draw the S.F and B.M diagrams for the beam and find the maximum bending moment. (10M)
   b) What are the sign conventions for shear force and bending moment in general? (4M)

4. Derive the bending equation. (14M)

5. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force F, at a section. Find the maximum shear in the cross section of the beam and draw the shear stress distribution diagram for the section. (14M)

6. Find the expression for the slope and deflection of a cantilever of length *L* which carries a uniformly distributed load over a length 'a' from the fixed end by Double integration method. (14M)

7. A thick spherical shell of 200 mm internal diameter is subjected to an internal fluid pressure of 7 N/mm^2. If the permissible tensile stress in the shell material is 8 N/mm^2, find the thickness of the shell. (14M)

|''|'''||''||'''||||
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Code No: R1621013 **R16** SET - 4

II B. Tech I Semester Regular Examinations, October/November - 2017
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) What are Temperature stresses? (2M)
   b) Draw SFD for SSB uniformly carrying varying load. (3M)
   c) Calculate Section Modulus for rectangular section. (2M)
   d) Define shear centre (2M)
   e) State Mohr's theorems of deflection. (2M)
   f) What is the radial pressure and hoop stresses for a thick spherical shell? (3M)

PART -B

2. Derive the relation between Modulus of elasticity, Modulus of rigidity and Bulk Modulus. (14M)

3. a) How will you draw the S.F and B.M diagrams for a beam which is subjected to inclined loads? (7M)
   b) A cantilever 2 m long is loaded with a uniformly distributed load of 2 kN/ m run over a length of 1m from the free end. It also carries a point load of 4 kN at a distance of 0.5 m from the free end. Draw the Shear force Diagrams and Bending Moment diagrams. (7M)

4. a) A rectangular beam 300 mm deep is simply supported over a span of 4 meters. Determine the uniformly distributed load per meter which the beam may carry, if the bending stress should not exceed 120 N/mm^2. Take I = 8 × 10^6 mm^4. (10M)
   b) What is pure bending? (4M)

5. The Shear force acting on a section of a beam is 50 kN. The section of the beam is of T-shaped of dimensions 100 mm × 100 mm × 20 mm. The moment of inertia about the horizontal neutral axis is 314.221× 10^4 mm^4. Calculate the shear stress at the neutral axis and at the junction of the web and the flange. (14M)

6. A cantilever of length 2 m carries a uniformly varying load of zero intensity at the free end, and 45 kN / m at the fixed end. If E = 2 × 10^5 N/mm^2 and $I = 10^8$ mm^4, find the slope and deflection of the free end. (14M)
~~~~~~

7. A steel cylinder of 300 mm external diameter is to be shrunk to another steel cylinder of 150 mm internal diameter. After shrinking the diameter at the junction is 250 mm and radial pressure at the common junction is 28 N/mm^2. Find the original difference in radii at the junction. Take $E = 2 \times 10^5$ N/mm^2. (14M)

DEPARTMENT OF MECHANICAL ENGINEERING

PROJECT REVIEW COMMITTEE:

Co-Ordinator : Mr. D. Prasad

Members : Mr. N.V. Malavika
: A.K. Chaitanya
: D. Kishore Babu
: K. Surendra Babu

Chief Evaluating Committee:

1. **Prof. Dr. P.S. Srinivas**

Special Interest Group (SIG)

Objective:

- The Major objective of the Special Interest group (SIG) are support the students of Department of Mechanical engineering, PSCMRCET in a way of improving the technical skills and train the students in the specific technology.
- The whole team helps to the students to complete their project in time and deliver the projects in a quality manner.
- Improve the knowledge of the student technologies.
- Improve work behaviour, so that student work better at assigned activity and fulfil their potentiality in project implementation.

Special Interest Group (SIG) Experts list:

S.No	Name of the Full-time teacher	Expert Skills
1	P. S. Srinivas	Production Engineering
2	G. Santhanam	Machine Design
3	N. V. Malavika	Manufacturing Engineering
4	D. Prasad	Thermal Engineering
5	K. Surendra Babu	Machine Design
6	T. Vijaya Sri Harsha	CAD/CAM
7	V. Chandrika	Thermal Engineering
8	D. Kishore Babu	CAD/CAM
9	A. Krishna Chaithanya	CAD/CAM
10	Ch. Saraswathi	Machine Design
11	M. Nagarjuna	Machine Design
12	K. V. N. Girish Kumar	Automobile Engineering
13	U. Ravi Kiran	Machine Design
14	G. Ravali	Thermal Engineering
15	V. Gowthami Priyanka	CAD/CAM
16	N. V. Madhu Sudhana Rao	Thermal Engineering
17	P. Beulah Mani	CAD/CAM
18	Ch.Srilatha	CAD/CAM
19	A.V.A.R Durga Rao	CAD/CAM
20	Mamidisetti M. S. Rao	Machine Design
21	S.Mohan Sai	CAD/CAM
22	E.Rama Krishna Reddy	Thermal Engineering
23	Ch. Jeevan Paul	Machine Design

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College of Engineering & Technology
Kothapet, VIJAYAWADA-520 001

PRINCIPAL

POTTI SRIRAMULU CHALAVADI MALLIKHARJUNA RAO
COLLEGE OF ENGINEERING & TECHNOLOGY

Department of Computer Science and Engineering

RUBRICS EXTERNAL MARKS ALLOCATION FOR PROJECT DISSERTATION-2017-18

Category				
Use of Project Duration Time (15)	Used time well. Focused on getting the project done without distracting others.	Used time well. Mostly focused on getting the project done without distracting others	Used some time well. Some focus on getting project done but occasionally distracted others.	Did not use class time to focus on the project OR often distracted others.
	15	12	9	5
Project Idea (15)	The topic and messages of the infographic are clear and easily understood.	Topic and main ideas are clear.	Topic is given but main ideas are unclear or lacking.	Topic and/or main ideas are absent or very unclear.
	15	12	9	5
Content – Relevance	Most of the content represents information appropriately.	Only few content do not relate to the information appropriately.	All content relate to the topic but do not represent appropriately.	Content do not relate to the topic.
	20	15	12	8
Design/layout (30)	The design/layout conforms to the solution of the problem, clear, and visually appealing.	Is acceptably conforming to the solution of the problem though it may be a bit messy.	Some of the design layout does not acceptably conforming to the solution of the	Is distractingly messy, not conforming to the solution of the problem, or very
	30	25	20	15
Implementation & Testing	Carried out thoroughly and the product is defect free.	Testing carried out adequately but not thoroughly and the product is defect free.	Testing carried out adequately but not thoroughly and few defects are found.	Testing not carried out at all and the product is having lot of defects.
	30	25	20	15
Documentationc (30)	Details (including images, tables, and labels) support the main idea without distracting with the project. Capitalization, grammar, punctuation are correct throughout.	Details (including images, tables, and labels) support the main idea without distracting with the project. But, there are few errors in capitalization or punctuation and few grammatical mistakes.	Details (including images, tables, and labels) support the main idea without distracting with the project but the documentation is not attractive. There are also few errors in capitalization or punctuation and also	Details (including images, tables, and labels) support the main idea without distracting with the project but the documentation is not attractive. There are also more errors in capitalization or punctuation and
	30	25	20	15
Total				

(Dr. B. Srinivasa Rao)

(Dr. A. P. Siva Kumar)
Head
Dept. of Computer Science & Engineering

(Dr. R. Rajeswara Rao)

POTTI SRIRAMULU CHALAVADI MALLIKHARJUNA RAO
COLLEGE OF ENGINEERING & TECHNOLOGY
Approved by AICTE, NEW DELHI and Affiliated to JNTU, Kakinada
Sponsored by : SKPVV Hindu High Schools Committee, Estd : 1906
D.No. 7-3-67, Raghava Reddy Street, Kothapet, Vijayawada - 520 001
Voice : 0866-2423442, 91777 77855, Fax : 0866-2423443, E-mail: principal@pscmr.ac.in, www.pscmr.ac.in

Department of Computer Science and Engineering

B-Sec

BEST PROJECTS EVALUATED

The following entitled projects are evaluated as best projects and are graded according to the sequence

1) Agricultural Seeding Drone

2) Unattended object Identification

3) IOT BASED Automatic Humanoid Detection System using Enhanced HAAR classifier.

Signature of External Examiner ..3/4/18

Department of Computer Science and Engineering

RUBRICS EXTERNAL MARKS ALLOCATION FOR PROJECT DISSERTATION:2017-18

Project Title : Visual cryptography for secrete image retrieval.
Project Guide : Mr.B.HANUMANTHA RAO

Category					Roll Numbers			
					14KT1A0517	14KT1A0547	14KT1A0503	15KT5A0501
Use of Project Duration Time (15)	Used time well. Focused on getting the project done without distracting others.	Used time well. Mostly focused on getting the project done without distracting others	Used some time well. Some focus on getting project done but occasionally distracted others.	Did not use class time to focus on the project OR often distracted others.				
	15	12	9	5	15	12	14	12
Project Idea (15)	The topic and messages of the infographic are clear and easily understood	Topic and main ideas are clear.	Topic is given but main ideas are unclear or lacking.	Topic and/or main ideas are absent or very unclear.				
	15	12	9	5	15	15	14	14
Content – Relevance	Most of the content represents information appropriately.	Only few content do not relate to the information appropriately.	All content relate to the topic but do not represent appropriately.	Content do not relate to the topic.				
	20	15	12	8	20	20	17	17

Category								
Design layout (30)	The design layout conforms to the solution of the problem, clear, and visually appealing.	Is acceptably conforming to the solution of the problem though it may be a bit messy.	Some of the design layout does not acceptably conforming to the solution of the problem and also a bit messy.	Is distractingly messy, not conforming to the solution of the problem, or very poorly designed.				
	30	25	20	15	30	30	26	26
Implementation & Testing	Carried out thoroughly and the product is defect free.	Testing carried out adequately but not thoroughly and the product is defect free.	Testing carried out adequately but not thoroughly and few defects are found.	Testing not carried out at all and the product is having lot of defects.				
	30	25	20	15	30	30	25	25
Documentatione (30)	Details (including images, tables, and labels) support the main idea without distracting with the project Capitalization, grammar, punctuation are correct throughout.	Details (including images, tables, and labels) support the main idea without distracting with the project. But, there are few errors in capitalization or punctuation and few grammatical mistakes.	Details (including images, tables, and labels) support the main idea without distracting with the project but the documentation is not attractive. There are also few errors in capitalization or punctuation and also grammatical mistakes.	Details (including images, tables, and labels) support the main idea without distracting with the project but the documentation is not attractive. There are also more errors in capitalization or punctuation and grammatical mistakes.				
	30	25	20	15	30	30	30	30
Total					140	138	127	125

PRC Committee

Signature of HOD

External Examiner

2.5.1

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College of Engineering & Technology
KOTTHA PETA, VIJAYAWADA - 520001.
Affiliated to JNTU, Kakinada & Approved by AICTE New Delhi
Department of Electronics and Communication Engineering

Dt: 22/04/2017

PROJECT REVIEW COMMITTEE

SL.NO	NAME OF THE FACULTY	DESIGNITION	SIGNATURE
1	Dr. J.Lakshmi Narayana	Professor & HoD	
2	Dr.B.Vanajakshi	Professor	
3	Mrs.Y.Kumari	Professor	
4	Mr.M.Ranga Rao	Professor	
5	Mr.G.V.Ramanaiah	Assoc. Professor	
6	Mr.D.Srikanth	Assoc. Professor	
7	Mrs.G.M.G.Madhuri	Assoc. Professor	
8	Mrs.M.N.L.Kalyani	Asst. Professor	
9	Mr.S.Pradeep Kumar	Asst. Professor	
10	Ms.T.Sireesha	Asst. Professor	

** Respective guides must present.

HoD of ECE

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Potti Sriramulu Chalavadi Mallikharjuna Rao
College of Engineering & Technology
Kothapet, VIJAYAWADA-520 001.

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College of Engineering & Technology
KOTTHA PETA, VIJAYAWADA - 520001.
Affiliated to JNTU, Kakinada& Approved by AICTE New Delhi

Department of ECE

Project Review Committee

This is to inform all faculty and students that the following are the Project Review Committee members:

S.No	Name of the faculty	Designation	Signature
1	Dr.J.lakshmiNarayana	Professor&HoD	
2	Dr.M.RangaRao	Professor	
3	Smt.Y.Kumari	Professor	
4	Sri.G.V.Ramanaiah	Associate Professor	
5	Sri.D.Srikanth	Associate Professor	
6	Smt.G.M.G.Madhuri	Associate Professor	
7	Sri.B.PraveenKitti	Assistant professor	
8	D.SureshBabu	Assistant professor	
9	B.MohanSwaroop	Assistant professor	
10	S.Pradeep Kumar	Assistant professor	

Signature of HoD

Signature of Principal

PRINCIPAL
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College of Engineering & Technology
Kothapet, VIJAYAWADA-520 001

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College of Engineering & Technology
KOTTHA PETA, VIJAYAWADA - 520001.
Affiliated to JNTU, Kakinada& Approved by AICTE New Delhi

General rules for Final year Project Period

The students shall abide by the rules and discipline and sign the declaration for project

Attendance in all classes, project classes is compulsory. The students shall abide by the undertaking signed by them that a minimum attendance of 75 percent must be maintained in all subjects and also inproject.

The students having less than 75% attendance, without prior intimation to their respective counsellors, guide and class teachers will not be allowed to the project reviews.

The students must attend the regular classes as well as project classes. Those who do not attend regular class in the morning will not be allowed in the afternoon for project.

Every student must wear the valid Identity Card, when in the college premises.

Every student shall wear a clean formal dress (boys-Plain shirt with full hands and formal trouser, girls –cotton chudidar with cotton dupatta) for reviews.

Every boy must come with tidy hair, clean shave, in-shirt and shoes.

During the project reviews the marks are distributed as follows:

i.30% of review marks for attendance

ii.30% ofmarks for guide

iii.40% of marks for presentation and result.

The marks will be displayed for the students after the completion of the review.

Six reviews will be conducted during project period .

For abstractreview ,the project batch should come with the following:

1.PPT :First slide-Project Title ,Guide Name,project students Along with college nameand logo

Second :Abstract,Third Onwards :Base paper and present project enhancement.

Total no.of slides:10-12

Duration :15mins

No Animation slides .Only plain text slides

2.Documentation(Spiral binding) :Project Title ,Guide Name,project students Along with college name and logo.Abstract.Introduction -explaination aboutBase paper and present project enhancement.

For further reviews,

1.PPT -Total no.of slides:10-12

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Duration :15mins

No Animation slides .Only plain text slides

2.Documentation(Spiral binding) :Project Title ,Guide Name,project students Along with college name and logo.Abstract.Documentation of the project work till date.

The project report must be updated for every review with the necessary corrections mentioned by the PRC members.Students must carry previous report along with the present one for reference.

Thecorrections mentioned by the PRC membersmust be modified in the next report without fail.

The marks will be awarded for every review and displayed after the completion of each review.Average of marks of six reviews are the final internal marks.

PRINCIPAL
Potti Sriramulu Chalavadi Mallikharjuna Rao
College of Engineering & Technology
Kothapet, VIJAYAWADA-520 001

Department of Civil Engineering

Project Review Committee:

Co-Ordinator : Mrs.S. Snigdha

Members : Mr.M. Sudhakar

Chief Evaluating Committee:

1. **Prof.K.V. Lakshmi Narayana**

Special Interest Group (SIG)

Objective:

- The Major objective of the Special Interest group(SIG) are support the students of Department of Civil engineering, PSCMRCET in a way of improving the technical skills and train the students in the specific technology.
- The whole team helps to the students to complete their project in time and deliver the projects in a quality manner.
- Improve the knowledge of the student technologies.
- Improve work behavior, so that student work better at assigned activity and fulfill their potentiality in project implementation.

Special Interest Group (SIG) Experts list:

S.No	Name of the faculty	Expert Skills
1.	S.Naga Bhargavi	Structural engg
2.	Syed Imran	Environmental Engg
3	B. Swetha Malika	Infrastructure Engg.
4	U Krishna Sainadh	Structural Engg.
5	K Prudhvi	Structural Engg.
6	T.S.V.Durga	Structural Engg.
7	P.Vinay	Structural Engg.

Areas of the Project:

- **Structural engineering**
- **Remote Sensing & GIS**
- **Geotechnical Engineering**
- **Water resources Engineering**
- **Infrastructure Engineering**
- **Environmental Engineering**
- **Construction technology and management**

HOD CIVIL DEPT.
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P. S. R. C. M. R. COLLEGE OF ENGINEERING & TECHNOLOGY
KOTTHA PETA, VIJAYAWADA - 520001.
Affiliated to JNTU, Kakinada& Approved by AICTE New Delhi
Department of Electrical and Electronics Engineering

PROJECT REVIEW COMMITTEE(AY2013-2014)

Coordinator : Mr. G.KISHOR BABU

MEMBERS : Mr. Y RAJENDRA BABU
Mr. B.MADHU KIRAN

Chief Evaluating Committee : P.MANOJ KUMAR
V RAJESH
K.NARENDRA

Special Interest Group (SIG)

Objective:

- The major objective of the Special Interest Group (SIG) are support the students of Department of EEE, PSCMRCET in a way of improving their technical skills and train the students in the specific technology.
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- Improve the knowledge of students in advanced technologies.
- Improve work behavior, so that students works better at assigned activity and fulfill their potentiality in project implementation.
- Build and Strengthen skills in the specific task to be completed for efficient functioning of the project implementation.

The goal of these objectives is increase access to quality Electrical and Electronics Engineering products and services.

Special Interest Group (SIG) Expert List:

S.NO	Name of the Faculty	Expert Skills
1	Mr. B. MADHU KIRAN	MATLAB, PSPICE
2	Mr. P.MANOJ KUMAR	MATLAB,
3	Mr. V RAJESH	MATLAB, PSPICE
4	Mr. K.NARENDRA	MATLAB

Areas of Projects:

- Power Quality
- FACTS Devices
- Smart Grid
- Renewable Energy Sources
- Power Electronics
- Power Systems

HOD - EEE

P. S. R. C. M. R. COLLEGE OF ENGINEERING & TECHNOLOGY
KOTTHA PETA, VIJAYAWADA - 520001.
Affiliated to JNTU, Kakinada& Approved by AICTE New Delhi
Department of Electrical and Electronics Engineering

PROJECT REVIEW COMMITTEE(AY2014-2015)

Coordinator : Mr. G.KISHOR BABU

MEMBERS : Mr. Y RAJENDRA BABU

Mr. B.MADHU KIRAN

Chief Evaluating Committee : P.MANOJ KUMAR

V RAJESH

K.NARENDRA

Special Interest Group (SIG)

Objective:

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Special Interest Group (SIG) Expert List:

S.NO	Name of the Faculty	Expert Skills
1	Mr. B. MADHU KIRAN	MATLAB. PSPICE
2	Mr. P.MANOJ KUMAR	MATLAB.
3	Mr. V RAJESH	MATLAB. PSPICE
4	Mr. K.NARENDRA	MATLAB

Areas of Projects:

- Power Quality
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HOD - EEE

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KOTTHA PETA, VIJAYAWADA - 520001.
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Department of Electrical and Electronics Engineering

PROJECT REVIEW COMMITTEE(AY2015-2016)

Coordinator : Mr. G.KISHOR BABU

MEMBERS : Mr. Y RAJENDRA BABU

Mr. B.MADHU KIRAN

Chief Evaluating Committee : P.MANOJ KUMAR

V RAJESH

K.NARENDRA

Special Interest Group (SIG)

Objective:

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2	Mr. P.MANOJ KUMAR	MATLAB,
3	Mr. V RAJESH	MATLAB, PSPICE
4	Mr. K.NARENDRA	MATLAB

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Areas of Projects:

- Power Quality
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- Smart Grid
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HOD - EEE

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Department of Electrical and Electronics Engineering

PROJECT REVIEW COMMITTEE(AY2016-2017)

Coordinator : Mr. G. KISHOR BABU

MEMBERS : Mr. Y RAJENDRA BABU

Mr. B.MADHU KIRAN

Mr. SK MUSTHAK AHMED

Chief Evaluating Committee : P.MANOJ KUMAR

V RAJESH

K.NARENDRA

Special Interest Group (SIG)

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2	Mr. P.MANOJ KUMAR	MATLAB.
3	Mr. V RAJESH	MATLAB, PSPICE
4	Mr. K.NARENDRA	MATLAB
5	Mr. SK MUSTHAK AHMED	MATLAB, PSPICE,PSCAD

Areas of Projects:

- Power Quality
- FACTS Devices
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HOD - EEE

P. S. R. C. M. R. COLLEGE OF ENGINEERING & TECHNOLOGY
KOTTHA PETA, VIJAYAWADA - 520001.
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Department of Electrical and Electronics Engineering

PROJECT REVIEW COMMITTEE(AY2017-2018)

Coordinator : Mr. V PRAVEEN

MEMBERS : Mr. Y RAJENDRA BABU

Mr. B.MADHU KIRAN

Mr. SK MUSTHAK AHMED

Chief Evaluating Committee : P.MANOJ KUMAR

V RAJESH

K.NARENDRA

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Areas of Projects:

- Power Quality
- FACTS Devices
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HOD - EEE

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KOTTHA PETA, VIJAYAWADA - 520001.
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Department of Electrical and Electronics Engineering

PROJECT REVIEW COMMITTEE(AY2018-2019)

Coordinator : Dr. V PRAVEEN

MEMBERS : Mr. Y RAJENDRA BABU

Mr. SK MUSTHAK AHMED

Chief Evaluating Committee : P.MANOJ KUMAR

V RAJESH

K.NARENDRA

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3	Mr. K.NARENDRA	MATLAB
4	Mr. SK MUSTHAK AHMED	MATLAB. PSPICE.PSCAD

Areas of Projects:

- Power Quality

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

PRINCIPAL
Potti Sriramulu Chalavadi Mallikharjuna Rao
College of Engineering & Technology
Kothapet, VIJAYAWADA-520 001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India

School of Management Studies

Course Structure MBA (Regular) 2013-2014

(Effective for the students admitted into first year from the academic year 2013-2014)

MBA – I – YEAR – I - Semester

S.No	Title	Marks	Credits
1	Management Theory & Organization Behavior	100	3
2	Managerial Economics	100	3
3	Accounting for Managers	100	3
4	Managerial Communication & Soft skills	100	3
5	Business Environment	100	3
6	Quantitative Analysis for Business Decision	100	3
7	IT – LAB	100	3

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Management Theory and Organizational Behavior

Unit -1.
Nature of Management– definitions, scope and importance - managerial roles and functions– development of management thought - approaches to management - Managing for competitive advantage - the Challenges of Management - Corporate Social responsibility. Planning: Nature and principles of planning - The Planning Process-MBO. Decision-making: role-significance-process-decision tree analysis – tools and techniques. Co-ordination-principles.

Unit 2
Nature of organizing - principles – organization levels – types - and span of management-Organizational design and structure, approaches–delegation of authority - centralization and decentralization of authority – responsive organization. Controlling- Nature and importance – process – feedback system – Requirement for effective control – control techniques.

Unit 3
Organizational behavior: Nature and scope – linkages with other social sciences - Individual perspective – Perception and process- Values, Attitudes- Learning and learning theories– Personality, types and models –Johari window – Transitional analysis-Approach to Organizational behavior - models of organizational behavior - Organizational culture and development.

Unit 4
Motivation – theories - Leadership – approaches to leadership – leadership behavior and styles – leadership skills – leadership in cross-cultural environment – women and corporate leadership – Group dynamics – group formation and development -conflict management and negation skills.

Unit 5
Organizational culture and effectiveness: Definition – creating organizational culture-approaches to organizational culture – learning of organizational culture – measurement of organizational culture – organizational effectiveness – nature and importance.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. William, Tripathy: "**MGMT (including instructor recourses)**", Cengage Learning, New Delhi, 2013
2. Dr.P.Subba Rao and Prof. N.Sambasiva Rao:"**Management and Organizational Behaviour - (Text and Cases)**", Himalaya Publishing House, Mumbai
3. Griffin, Moorhead: "Managing Organisational Behaviour", Cengage Learning, New Delhi.2013.

4 Jerald Greenberg and Robert A Baron: "***Behavior in Organizations***", PHI Learning Private Limited, New Delhi, 2009.
5 Mullins, Laurie: "**Management and Organisational Behaviour**", Pearson Education, New Delhi, 2013
6 Jennifer M.George and Gareth R. Jones: "***Understanding and Managing Organizational Behavior***", Pearson Education, New Delhi, 2009.
7 Meenakshi Gupta: "***Principles of Management***", PHI Private Limited, New Delhi, 2009.
8 J S Chandan: "***Management Theory and Practice***", Vikas Publishing House Limited, 2009
9 Anil Bhat, Arya Kumar: "***Management***", Oxford University, New Delhi, 2008.
10 Jai B.P.Sinha: "***Culture and Organizational Behavior***", Sage Publication India Private Limited, New Delhi, 2008.
11 K.Aswathappa: "**Organizational Behavior-Text, Cases and Games**", Himalaya Publishing House, New Delhi, 2008,
12 Gupta R S, Sharma B D Bhalla N S: "**Principles and Practice of Management**", Kalyani Publications, Hyderabad, 2008.
13 PareekUdai: "***Understanding Organizational Behavior***", Oxford University Press, New Delhi, 2007.

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Managerial Economics

UNIT 1:
Introduction to Managerial Economics: Definition, Nature and Scope, Relationship with other areas in Economics, The role of managerial economist. Concept of opportunity cost, Incremental concept, time Perfective, Discounting Principle , Risk & uncertainty.

UNIT 2:
Demand Analysis: Elasticity of demand, types and significance of Elasticity of Demand - Measurement of price Elasticity of Demand – Need for Demand forecasting, forecasting techniques, Law of Supply, Elasticity of Supply.

UNIT 3:
Production Analysis: Production function, Marginal Rate of Technical Substitution, Production function with one/two variables, Cobb-Douglas Production Function, Returns to Scale and Laws of returns.

UNIT 4:
Cost theory and estimation: Cost concepts, determinants of cost, cost – output relationship in the short run and long run – Modern development in cost theory – Saucer shaped short – run Average cost curves – Average total cost curve – Cost - Volume – Profit analysis

UNIT 5:
Market Structure and Pricing practices: Features and Types of different Markets – Price- Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly both in the long run and short run. Pricing methods in practice – Bain's limit pricing theory - Managerial Theories of a firm – Marris & Williams Models.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Paul, Koushil: "**Managerial Economics**", Cengage Learning, New Delhi,
2. Siddiqui S A,Siddiqui A S: "**Managerial Economics**", and Financial Analysis", New Age International Publishers, New Delhi, 2008.
3. Vanita Agarwal: "**Managerial Economics**", Pearson, New Delhi, 2013.
4. Dominick Salvatore: "**Managerial Economics**", Oxford University Press, New Delhi,2010.
5. D.L. Ahuja: "**Managerial Economics**", S. Chand & Company ltd,New Delhi-55.
6. O'Sullivan, Sheffrin, Perez "Micro Economics: Principles, Applications and Tools", Pearson Education.
7. Mithani D M: '**'Managerial Economics**", Himalaya Publishing House, Mumbai, 2008.

8. Dwivedi D N: ‘**’Managerial Economics**”, Vikas Publishing House Private Limited, New Delhi, 2009.
9. S.B. Srivastava: “**Engineering and Managerial Economics**”, SCITECH Publication, New Delhi.
10. Atmanand: “**Managerial Economics**”, Excel Publications. New Delhi, 2012.
11. Varshney, R.L and Maheswari, K L: ‘**’Managerial Economics**”, Sultan Chand and Sons, New Delhi, 2002.
12. Narayanan Nadar E, Vijayan S: ‘**’Managerial Economics**”, PHI Private Limited, New Delhi,2009.
13. Hirscgey: “**Managerial Economics**”, Cengage Learning, New Delhi, 2013.
14. P.N.Chopra: “**Managerial Economics**”, Kalyani Publications, New Delhi, 2011

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Accounting for Managers

UNIT 1

(a) Accenting process: Definition of accounting. Accounting Cycle. Classification of accounts, accounting equation – static and dynamic nature of accounting. Users of accounting information. Books of original entry, ledger, trial balance, Terminal accounts. Accounting Concepts and conventions and their implications on the data generation.

(b) Measuring Business income: Distinction between capital and revenue: Matching revenue and Expenditure; The role of accounting policies like Depreciation and inventory valuation on reported income and related accounting standards (AS).

UNIT-2 Understanding Terminal accounts: a) preparation and presentation of income statement; Balance Sheet
b) Accounting standards–their rationale and growing importance in global accounting environment, IAS-IFRS-US GAAP; Human resource accounting concept and importance – Valuation of human resources. Preparation and presentation of final accounts of companies. Guidelines for disclosure.
C) Taxation and tax planning; corporate tax rates and tax structure;

UNIT-3
Financial Analysis: The scope and purpose of financial analysis; financial statement analysis. a)Ratio analysis – liquidity, activity, structural, coverage and profitability ratios; predictive power of ratio analysis; Inflation and financial analysis; applications of financial analysis; Related AS.
b) Funds flow analysis; concepts of funds; ascertaining funds from operations ; Sources of funds: Uses of funds; Preparation and analysis of funds flow statement and cash flow statement. Related AS.

UNIT-4
Cost accounting concepts; role of cost accounting information in planning and control; interfaces of cost accounting; financial accounting and managerial accounting; Cost concepts. Determination of product cost. Preparation of cost sheet under different cost heads

UNIT-5
Cost behavior and Decision making; methods for determining fixed and variable costs; CVP analysis and decision making break even analysis- key factor distribution & analysis; Optimization of product mix, make or buy decisions.
Capacity utilization, plant shutdown, CVP under conditions of uncertainty-sensitivity analysis, Standard costing, Definition of Standard Costing, Purpose of standards, Types of standards, standard setting. Zero based budgeting: concept , importance and relevance.

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Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Vijaya Kumar.P, Ravindra P.S., Kiran Kumar V: "**Accounting for Managers**", Himalaya Publishing House, New Delhi, 2013
2. Shankarnarayana, Ramanath: "**Finanacial Accounting for Management**", Cengage Learning, New Delhi.
3. Ramachandran N, RamKumar Kakani: **Financial Accounting for Management**", McGraw Hill – 2013.
4. Maheshwari, Maheashwari and Maheshwari, "**Financial Accounting**", Vikas publishing House, New Delhi,2013
5. Amberish Gupta:"**Financial Accounting for Management**", Pearson Education, 2012.
6. Paresh Shah: "**Financial accounting for management**", Oxford University press, New Delhi, 2013.
7. Dr. Jawahar Lal: "**Accounting for management**", Himalaya Publishing house, NewDelhi, 2012.
8. Asish K. Bhattacharyya: "**Essentials of Financial Accounting**", PHI Learning, New Delhi, 2012.
9. Dr. V.R.Palanivelu: "**Accounting for Management**". University Science Press, New Delhi, 2009.
10. Ashok Banerjee: "**Financial Accounting**", a managerial Emphasis, Excel books, New Delhi, 2012.

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Managerial Communication

UNIT 1

Role of Communication in Business – Objective of Communication – The Process of Human Communication – Media of Communication, Written Communication - Oral Communication - Visual Communication, Audio Visual Communication – Silence-Developing Listening Skills – Improving Non-verbal communication skills – Cross Cultural Communication – problems and challenges.

UNIT 2

Managing Organization Communication – formal and Informal Communication - Intrapersonal Communication – Models for Inter Personal Communication - Exchange Theory.

UNIT 3

Managing Motivation to Influence Interpersonal Communication- Inter-Personal communication – Role of Emotion in Inter Personal Communication – Communication Styles – Barriers to Communication – Gateways to Effective Interpersonal Communication.

UNIT 4

Business Writing Skills- Significance of Business Correspondence, Essentials of Effective Business Correspondence, Business Letter and Forms, Meeting, Telephone Communication – Use of Technology in Business Communication. Report Writing – Meaning and Significance: Structure of Reports - Negative, Persuasive and Special Reporting: Informal Report – Proposals. Formal Reports.

UNIT 5

Presentation skills – techniques of presentation – types of presentation – video Conferencing and formats – interview – formal and informal – interview techniques –Communication etiquettes.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.
2. Kuberudu B and Srinivasa Krishna K: "***Business Communication and Soft Skills***", Excel Books, 2008.
3. Meenakshi Rama: "***Business Communication***", Oxford University Press, New Delhi
4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai
5. Paul Turner: "***Organisational Communication***", JAICO Publishing House, New Delhi.
6. SathyaSwaroopDebasish, Bhagaban Das" "***Business Communication***", PHI Private Limited, New Delhi, 2009.

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7. R.K.Madhukar: "**Business Communication**", Vikas Publishing House, New Delhi, 2012.
8. Kelly M Quintanilla, Shawn T.Wahl:"**Business and Professional Communication**", SAGE, New Delhi, 2012.
9. Sangita Mehta, NeetyKaushish: "**Business Communication**", University Science Press, New Delhi, 2010.
10. Anjali Ghanekar: "**Business Communication Skills**", Everest Publishing House, New Delhi, 202011

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Business Environment

UNIT 1

Business Environment: Importance at national and international level – problems and challenges – factors both internal and external influencing business environment. Industrial policies since independence and their significance – regulatory and promotional framework - Five-year plans and their importance.

UNIT 2

Structure of Indian economy – Nature and significance – Economic systems – structure of Indian industry – Economic reforms in various sectors – nature – challenges – social justice – Disinvestment mechanism – problems and procedures – Sickness in Indian industry, competition Act 2002.

UNIT 3

Fiscal Policy: nature and significance – public revenues – expenditure- debt, development activities allocation of funds – critical analysis of the recent fiscal policy of Government of India.Balance of Payments: Nature – structure – major components – causes for disequilibrium in balance of payments – correction measures.

UNIT 4

India's Trade Policy: Nature – Magnitude and direction of Indian international trade – problems – bilateral and multilateral trade agreements. International business environment: Nature – significance– challenges and mechanisms. WTO: Agreements in the Uruguay round including TRIPS, TRIMS and GATS – disputes settlement mechanism – dumping and antidumping measures.

UNIT 5

Legal Frame: special features of the SICA (special provisions) 1985, BIFR, Consumer protection act 1986, Environmental laws (pertaining to the control and prevention of Air and Water pollution) and the Essential Commodities Act 1955.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Shaikh Saleem: "**Business Environment**", Pearsons, New Delhi,
2. Veena Keshav Pailwar: "**Economic Environment of Business**", PHI Learning, New Delhi, 2012
3. Rosy Joshi, Sangam Kapoor: "**Business Environment**", Kalyani Publishers, New Delhi, 2011.
4. Aswathappa K: "**Essentials of Business Environment**", Himalaya Publishing House, New Delhi, 2011.
5. Vivek Mittal: "**Business Environment Text and Cases**", Excel Books New Delhi, 2011.

6. Sundaram and Black: "***International Business Environment Text and Cases***", PHI Private Limited, New Delhi.
7. Avid W Conklin: "***Cases in Environment of Business***", Sage Publication India Private Ltd, New Delhi.
8. Raj Kumar: "**International Business Environment**", Excel Publication, New Delhi, 2012.
9. Palle Krishna Rao: "***WTO-Text and Cases***", Excel Publication, New Delhi.
10. Government of India, ***Latest Economic Survey Report***.

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KAKINADA - 533 003, Andhra Pradesh, India

Quantitative Techniques for Business Decisions

UNIT 1

Basic Mathematical & Statistical Techniques**:** Linear, Quadratic, Logarithmic and Exponential Functions- Permutations and Combinations – Matrices - Elementary operations of matrices. Measures of Central Tendency – Measures of Dispersion –Simple Correlation and Regression Analysis

Concept of Probability- Probability Rules – Joint and Marginal Probability – Baye's Theorem- Probability Distributions- Binomial, Poisson, Normal and Exponential Probability Distributions.

UNIT 2

Introduction to Decision Theory: Steps involved in Decision Making, different environments in which decisions are made, Criteria for Decision Making, Decision making under uncertainty, Decision making under conditions of Risk-Utility as a decision criterion, Decision trees, Graphic displays of the decision making process, Decision making with an active opponent.

UNIT 3

Linear Programming: Formation of mathematical modeling, Graphical method, the Simplex Method; Justification, interpretation of Significance of All Elements In the Simplex Tableau, Artificial variable techniques: Big M method, Two phase method.

UNIT 4

Transportation, Assignment Models & Game theory: Definition and application of the transportation model, solution of the transportation problem, the Assignment Model, Traveling Salesman Problem. Game Theory: Introduction – Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, matrix and arithmetic methods.

UNIT 5

P.E.R.T. & C.P.M. and Replacement Model: Drawing networks – identifying critical path – probability of completing the project within given time- project crashing – optimum cost and optimum duration. Replacement models comprising single replacement and group replacement

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. N.D.Vohra: "***Quantitative Techniques in Management***", Tata-McGraw Hill Private Limited, New Delhi, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India

2. J. K. Sharma, "***Operations Research: Theory and Applications***", Macmillan Gupta S.P: "***Statistical Methods***", S. Chand and Sons, New Delhi,
3. Anand Sharma: "**Quantitative Techniques for Business decision Making**", Himalaya Publishers, New Delhi,2012;
4. D P Apte: "***Operation Research and Quantitative Techniques***", Excel Publication, New Delhi, 2013
5. Hamdy, A.Taha: "***Operations Research: An Introduction***", Prentice-Hall of India, New Delhi 2003.
6. Anderson: "**Quantitative Methods for Business**", Cengage Learning, New Delhi 2013
7. Sancheti, Dc & VK Kapoor, "**Business Mathematics**", S Chand and Sons, New Delhi
8. R.B.Khanna: "**Quantitative Techniques for Managerial Decision**", PHI Learning, New Delhi, 2012.
9 Keller, G, "**Statistics for Management**", 2009, 1st Ed, Cengage Learning.

10 Amir D. Aczel and Jayavel Sounderpandian, "**Complete Business Statistics**", TMH,
11 C.R.Kothari: "**Quantitative Techniques**", Vikas Publishing House, New Delhi, 2010
12 L.C.Jhamb: "**Cases and Problems in Quantitative Techniques**", Everest Publishing House, New Delhi,

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KAKINADA - 533 003, Andhra Pradesh, India

Information Technology Lab (100% Lab)

UNIT 1

Introduction of various software used for business and their significance in the current business environments. Introduction of software MS Office, SQL.

UNIT 2

Financial modeling like present value of cash flows, valuations, financial ratio analysis, forecasting, trend analysis of data, random input generations

UNIT 3

Statistics for management - correlation and regression analysis data presentation techniques. Spread sheet showing the monthly payments with changing interest rate over a period of loan. (Using excel)

UNIT 4

Data Collection and analyzing techniques - chats, flow diagrams TQM methodologies

UNIT5

Preparation and presentations of mini projects assigned for course work of first semester.

References:

1. Shelly, Cashman: "Microsoft copies 2007", Cengage Learning, New Delhi. 2012

JAWAHARLAL NEHRU TENHNOLOGICAL UNIVERSITY KAKINADA: KAKINADA

School of Management Studies

M.B.A. Regular

(w.e.f academic year 2009-2010)

Syllabus

Semester - I

Management Theory and Practice

1. Management – definitions, scope and importance - types of managers; managerial roles and functions; Science or Art? Internal and External environment - Administration vs. Management, – Managing people and organizations in the context of New Era- Managing for competitive advantage - the Challenges of Management - Corporate Social responsibility- Managerial Ethics.

2. Perspectives on Management: Evolution of Management- Various approaches to management- Global perspectives of management- Role of communication in management.

3. Planning: Nature and principles of planning, Steps in planning, types of planning, Levels of planning – The Planning Process-MBO. Decision making-role-significance – decision making process-decision tree analysis. Co-ordination-principles.

4. Organizing**:** Nature of organizing-principles – organization levels and span of management- Organizational design and structure – departmentation, line and staff concept, staffing – delegation, centralization and decentralization of authority – responsive organization.

5. Leading: Dimensions of Leadership – Leading Vs Managing – approaches to leadership – leadership behavior and styles – leadership skills – leadership in cross-cultural environment – evaluation of leader – women and corporate leadership – Motivation theories – group dynamics - team, inter-group behavior, conflict and negation skills and conflicts management.

6. Controlling**:** Nature and importance – process – feedback system – Requirement for effective control – control techniques. Modern techniques of control..

7. Total Quality Management: Definition and importance – evolution of TQM – different dimensions – quality management philosophies and practices.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit.

References

1. Koonz, Weihrich and Aryasri: "***Principles of Management***", Tata McGraw Hill, 2004.
2. Daft: "***The New Era of Management***", Cengage Learning , New Delhi, 2009.
3. Rao, VSP: "***Management Text and cases***", Excel books, New Delhi
4. Stoner, Free man and Gilbert: "***Management***", Pearson Education, New Delhi, 2002
5. Prem Vrat, K.K.Ahuja, P K Jain: "***Case Studies in Management***", Vikas Publishing House Limited, 2002.
6. Mrityanjay Kumar Srivastava: "***Transformational Leadership***", Macmillan India Limited, 2003
7. Ramaswamy,T: "***Principles of Management***", Himalaya Publishing House, Mumbai, 2008.
8. Meeenakshi Gupta: "***Principles of Management***", PHI Private Limited, New Delhi, 2009.
9. J S Chandan: "***Management Theory and Practice***", Vikas Publishing House Limited, 2009
10. Robert KReitner, Mamata Mohapatra: "***Management***" Biztantra, dreamtech Press, New Delhi, 2008
11. Anil Bhat, Arya Kumar: "***Management***", Oxford University, New Delhi, 2008.
12. Schermerhorn Jr.: "***Management*** ", Wiley-India, New Delhi, 2008.
13. Gupta R S, Sharma B D Bhalla N S: "Principles and Practice of Management", Kalyani Publications, Hyderabad, 2008.

Managerial Economics

1. Introduction to Managerial Economics: Definition, Nature and Scope, Relationship with other areas in Economics, - The role of managerial economist.

2. Basic economic principles – the concept of opportunity cost, incremental concept, scarcity, marginalism, Equi-marginalism, Time perspective, discounting principle, risk and uncertainty.

3. Theory of Demand: Demand Analysis, Elasticity of demand, types and significance of Elasticity of Demand – Measurement of Price Elasticity of Demand - Demand determinants – Need for Demand forecasting, forecasting techniques. Supply Analysis – supply function, the Law of Supply, Elasticity of Supply.

4. Production Analysis: Production function, Marginal Rate of Technical Substitution, Production function with one/two variables, Cobb-Douglas Production Function, Returns to Scale and Returns to Factors, Economies of scale-

5. Cost theory and estimation: Cost concepts, determinants of cost, cost-output relationship in the short run and long run – Modern development in cost theory – Saucer shaped short-run Average cost curves – Average total cost curve.

6. Market Structure and Pricing practices: Features and Types of different Markets - Price-Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly both in the long run and short run. Pricing methods in practice – Bain's limit-pricing theory.

7. Profit Management: Nature, scope, Theories of profit including modern theory - Measurement policies, Cost – Volume- Profit Analysis. Objectives of the firm: Theories of a firm.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit.

References

1. Hirschey: "***Economics for Managers***", Cengage Learning, New Delhi, 2009
2. M.L Trivedi: "***Managerial Economics***", Tata Mc-Graw Hill, New Delhi, 2004
3. Siddiqui S A, Siddiqui A S: "***Managerial Economics and Financial Analysis***", New Age International Publishers, New Delhi, 2008.
4. Craig H. Petersen, Cris Lewis, Sudhir k Jain: "***Managerial Economics***", Pearson Education, New Delhi, 2009
5. Dominick Salvatore: "***Managerial Economics***", Oxford University Press, New Delhi, 2009.

6. Mithani D M: "***Managerial Economics***", Himalaya Publishing House, Mumbai, 2008.
7. Dwivedi D N: "***Managerial Economics***", Vikas Publishing House Private Limited, New Delhi, 2009.
8. William f, Samuelson, Stephen G,Marks: "***Managerial Economics***", Wiley India Publishers, New Delhi, 2008.
9. Varshney, R.L and Maheswari, K L: "***Managerial Economics***", Sultan Chand and Sons, New Delhi, 2002.
10. Narayanan Nadar E, Vijayan S: "***Managerial Economics***", PHI Private Limited, New Delhi, 2009.

Financial Accounting and Analysis

1. Introduction to Accounting: Importance, Objectives and Principles, Accounting Concepts and conventions, and The Generally Accepted Accounting Principles (GAAP), Accounting Standards issued by Institute of Chartered Accountants of India.

2. The Accounting Process: Overview, Books of Original Record; Journal and Subsidiary books, ledger, Trial Balance, Classification of capital and revenue expenses, Final Accounts with adjustments.

3. Valuation of fixed assets: Tangible vs Intangible assets, depreciation of fixed assets and methods of depreciation.

4. Inventory Valuation: Methods of inventory valuation and valuation of goodwill, methods of valuation of goodwill.

5. Issue of Shares and Debentures: Entries for Issue of shares, forfeiture - Issue of shares at Discount and premium. Alteration of share capital and reduction of share capital, Issue and Redemption of Debentures:
6. Accounting for Amalgamation, Absorption and Reconstruction: Accounting treatment in the books of transferor and transferee. Simple problems.

7. Financial Analysis-I: Statement of Changes in Working Capital, Funds flow and cash flow statement – Analysis and interpretation of financial statement from investor and company point of view – analysis through different ratios – Du Pont Chart.

8.: Case Study: Compulsory. Relevant cases have to be discussed in each unit

References

1. Asish K. Bhattacharyya: "***Essentials of Financial Accounting***", PHI Private Limited, New Delhi, 2009,
2. Maheshwari S N, Mahehwari S K: "***Financial Accounting*** ", Vikas Publishing House Private Limited, New Delhi, 2009,
3. Paresh Shah: "***Basic Financial Accounting for Management***", Oxford University Press, New Delhi, 2008.
4. Varma K K: "***Financial Accounting and Analysis***", Excel Books, New Delhi,
5. Robert N Anthony, David F Hawkins, Kenneth A Merchant: "***Accounting***" Tata McGraw-Hill Publishing Limited, New Delhi, 2008.
6. Stice & Stice: "***Financial Accounting Reporting and Analysis***", Cengage Learning, New Delhi, 2008.
7. Subhash Sharma, Vithal M P: "***Financial Accounting for Management***", MacMillan India Limited, New Delhi, 2008.

8. Kaustubh Arvind Sontakke: "***Financial Accounting***", Himalaya Publishing House, New Delhi, 2008.
9. Belverd E. Needles, Marian Powers: "***Financial Accounting***", Biztantra, New Delhi, 2008.
10. Ashok Banerjee: "***Financial Accounting***", Excel Books, New Delhi, 2006.
11. Gupta: "***Financial Accounting for Management***", Pearson Education, New Delhi, 2003.

Organizational Communication

1 Role of Communication in Business – Objective of Communication – The Process of Human Communication – Media of Communication, Written Communication - Oral Communication - Visual Communication, Audio Visual Communication – Silence.

2. Developing Listening Skills – Improving Non-verbal communication skills – Cross Cultural Communication – problems and challenges.

3 Managing Organization Communication – formal and Informal Communication - Intrapersonal Communication – Models for Inter Personal Communication - Exchange Theory.

4 Managing Motivation to Influence Interpersonal Communication- - Inter-Personal Perception – Role of Emotion in Inter Personal Communication – Communication Styles – Barriers of Communication – Gateways to Effective Interpersonal Communication.

5 Business Writing Skills- Significance of Business Correspondence, Essentials of Effective Business Correspondence, Business Letter and Forms, Meeting, Telephone Communication – Use of Technology in Business Communication.

6. Report Writing – Meaning and Significance: Structure of Reports - Negative, Persuasive and Special Reporting: Informal Report – Proposals. Formal Reports – Preparation and organization of Press Report.

7 Presentation skills – techniques of presentation – types of presentation – video Conferencing and formats – interview – formal and informal – interview techniques – Communication etiquettes.

8 Case Study: Compulsory. Relevant cases have to be discussed in each unit

References:

1. Krizan: "***Essentials of Business Communication***", Cengage Learning, New Delhi.
2. Herta A Murphy, Herber W Hildebrandt and Jane P Thomas: "***Effective Business Communication***", Tata McGraw Hill Education Pvt Ltd, New Delhi.
3. Kuberudu B and Srinivasa Krishna K: "***Business Communication and Soft Skills***", Excel Books, 2008.
4. Paul Turner: "***Organisational Communication***", JAICO Publishing House, New Delhi.

5. Namita Gopal: "***Business Communication***", New Age International Publishers, New Delhi, 2009.
6. Sathya Swaroop Debasish, Bhagaban Das" "***Business Communication***", PHI Private Limited, New Delhi, 2009.
7. Sampat Mukherjee, Sanjib Kumar Basu: "***Organization, Management, Business Communication***", New Age International Publishers, New Delhi, 2005.
8. Dalmar Fisher: "***Communication in Organizations***", JAICO Publishing House, New Delhi, 2007.
9. Meenakshi Rama: "***Business Communication***", Oxford University Press, New Delhi,
10. Rayudu, CS: "***Communication***", Himalaya Publishing House, Mumbai.

Business Environment

1. Business Environment: Importance at national and international level – problems and challenges – factors both internal and external influencing business environment. Industrial policies since independence and their significance – regulatory and promotional framework. Five-year plans and their importance.
2. Structure of Indian economy – Nature and significance – Economic systems – structure of Indian industry – Economic reforms in various sectors – nature – challenges – social justice – Disinvestment mechanism – problems and procedures – Sickness in Indian industry, competition Act 2002.
3. Fiscal Policy: nature and significance – public revenues – expenditure- debt, development activities allocation of funds – critical analysis of the recent fiscal policy of Government of India.
4. Balance of Payments: Nature – structure – major components – causes for disequilibrium in balance of payments – correction measures – Economic policy and balance of payment – recent trends.
5. India's Trade Policy: Nature – Magnitude and direction of Indian international trade – problems – bilateral and multilateral trade agreements - EXIM policy – role of EXIM bank. Nature and Role of stock exchanges in India – policies for the protection of stakeholders.
6. International business environment: Nature – significance – trends in international business – theories – challenges and mechanisms. WTO: Agreements in the Uruguay round including TRIPS, TRIMS and GATS – disputes settlement mechanism – dumping and antidumping measures.
7. Legal Frame : special features of the SICA (special provisions) 1985, BIFR, Consumer protection act 1986, Environmental laws (pertaining to the control and prevention of Air and Water pollution) and the Essential Commodities Act 1955.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit

References:

1. Dutt and Sundaram: "***Indian Economy***", S. Chand, New Delhi, 2007.
2. Francis Cherunilam: "***Business Environment-Text and Cases***", Himalaya Publishing House, Mumbai.
3. Justin Paul: "***Business Environment***", Tata McGraw Hill, New Delhi, 2006.
4. Aswathappa K: "Essentials of Business Environment", Himalaya Publishing House, Mumbai.
5. Raj Agrawal: "***Business Environment***", Excel Publication, New Delhi.
6. Sundaram and Black: "***International Business Environment Text and Cases***", PHI Private Limited, New Delhi.
7. Avid W Conklin: "***Cases in Environment of Business***", Sage Publication India Private Ltd, New Delhi.
8. Palle Krishna Rao: "***WTO-Text and Cases***", Excel Publication, New Delhi.

9. Shaikh Saleem: "***Business Environment***", Pearson Education, New Delhi, 2008.
10. Veena Keshap Pailwar: "***Economic Environment*** of Business", PHI Private Limited, New Delhi, 2009.
11. Ravinder Kumar: "***Legal Aspects of Business***", Cengage Learning, New Delhi, 2009.
12. Government of India, ***Latest Economic Survey Report***.

Quantitative Analysis for Business Decisions

1 Introduction to Decision Theory, Steps involved in Decision Making, different environments in which decisions are made, Criteria for Decision Making. Decision Making under uncertainty. Decision Making Under conditions of Risk-Utility as a decision criterion, Decision Trees, Graphic Displays of the Decision Making Process, Decision Making with an active opponent.

2 Linear Programming: Introduction to Maximization and Using Graphic Methods, the Simplex Method; Justification, interpretation of Significance of All Elements In the Simplex Tableau, the Simplex Solution to A Minimizing Problem.

3 Transportation Models: Definition and Application of the Transportation Model, Solution of the Transportation Problem, the Assignment Model, Traveling Salesman Problem.

4 Game Theory: Introduction – Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, matrix and arithmetic methods.

5 Statistical Inference: Tests of Hypothesis, Introduction to Null hypothesis vs alternative hypothesis, parametric vs. non-parametric tests, procedure for testing of hypothesis, tests of significance for small samples, application, t-test, Chi Square test.

6 Linear correlation coefficient Linear regression ; Non Linear regression ;Multiple correlation and multiple regression: Regression Analysis : Least square fit ; polynomial and Curve fittings

7 Statistical Quality Control Upper quality charts p charts LCL UCL, BAR CHARTS. Attribute charts and industrial applications. , ANOVA – one way and two way classifications and Chi-square test, Association of attributes and inferences.

8 P.E.R.T. & C.P.M. and Replacement Model: Drawing networks – identifying critical path – probability of completing the project within given time- project crashing – optimum cost and optimum duration. Replacement models comprising single replacement and group replacement

References

1. Selvaraj R., Loganadhan, C "***Quantitative Methods in Management***", Excel Publication, New Delhi.
2. Jaisankar S, "***Quantitative Techniques for Management***", Excel Publication, New Delhi.

3. Hamdy, A.Taha: "***Operations Research: An Introduction***", Prentice-Hall of India, New Delhi 2003.
4. J. K. Sharma, "***Operations Research: Theory and Applications***", Macmillan India, 2001.
5. Bill E Gillett: "***Introduction To Operations Research: A Computer-Oriented Algorithmic Approach***" Tata McGraw Hill, New Delhi, 2002.
6. Anderson Sweeny Williams: "***Statistics for Business and Management***", 10/e, Cengage Learning, New Delhi.
7. N.D.Vohra: "***Quantitative Techniques in Management***", Tata-McGraw Hill Private Limited, New Delhi, 2003.
8. L.S. Srinath: "***PERT/CPM***", East-West Publishers, Mumbai, 2003
9. Gupta S.P: "***Statistical Methods***", Sultan Chand and Sons, New Delhi, 2005
10. U.K.Srivastava, G.V.Shenoy, S.C.Sharma: "***Quantitative Techniques for managerial decisions***", New Age International, Mumbai, 2008,
11. Punmia and Khandelwal: "***PERT/CPM***, Laxmi Publications, Hyderabad, 2009.

Data Base Management System

1. Foundation of Information System in Business: Conceptual foundations, Perspectives on IS – Phases in building and maintaining IS - Business Processes - Viewing business as system – Evaluation of business process performance.

2. Types of Information Systems: Office Automation System, Communication systems, Transaction processing system, Management and Executive information system, Decision support systems, GDSS, Systems from a functional perspective-sales, production, finance, human resources system.

3. Information Systems Models: Nolan Stage Hypothesis, IS Strategic Grid, Wards Model, Earl's Multiple Methodology, CSFs, Soft Systems Methodology, Socio-Technical Systems Approach.

4. Building and Maintaining IS: Alternative approaches for building information systems – end user development – Outsourcing. Information Security, control and audit – Systems vulnerability and abuse, different threats in IS – methods of minimizing risks, creating control environment

5**.** Data base Management System: Objectives of Database Approach – Characters of Data Base Management Systems – Data processing Systems – Components of DBMS Packages – Data base administration.

6. Data Modeling Concept: Development of Data Models – File Management The Hierarchical Data base Models. Physical Vs Logical Models of Data – Network Database Structure

7 Organizational Memory Technologies: Data warehouse – Information presentation – website management - Data integrity- Transaction management - Management of database environment - Data administration.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit

References

1. Philip J, Pratt, Joseph J. Adamski: "***Database Management Systems***", Cengage Learning, New Delhi, 2009.
2. W S Jawadekar: "***Management Information Systems***", Tata McGraw Hill Private Limited, New Delhi, 2009.
3. Mahadeo Jaiswal, Monika Mital: "***Management Information System***", Oxford University Press, New Delhi, 2008.
4. Goyal DP: " ***Management Information System***", MACMILLAN India Limited, New Delhi, 2008.

5. C.S.V.Murthy: "***Management Information System***", Himalaya Publications, New Delhi, 2008.
6. Richard T. Watson: "***Data Management*** ", WILEY INDIA Limted, New Delhi, 2008.
7. Alex Leon and Mathew Leon: "***Data Base Management Systems***", Vikas Publishing House, New Delhi.
8. R.Panneerselvam: "***Database Management System***", PHI Private Limited, New Delhi, 2008.

9. Kennth C.Laudon and Jane P.Laudon: "***Management Information Systems***" 9/e, Pearson Education, New Delhi.
10. Rob and Cornell: "***Data Base Management Systems***" Cengage Learning, New Delhi,

Information Technology Lab-1 (100% Lab)

Course Objective

1. Introduce spreadsheet (MS Excel) as a financial modeling tool and understand its capabilities and limitations
2. Apply Visual Basic for Applications (VBA) to automate spreadsheet applications and extend the functionality of the spread sheet
3. Improve the understanding of software systems in business, improve communication and presentation skills using MS Power Point

Course Details:

1. Introduction of various software used for business and their significance in the current business environments. Introduction of software MSOffice, VBA, MS PROJECT, SQL, PL/SQL

2. Financial modeling like present value of cash flows, valuations, financial ratio analysis, forecasting, trend analysis of data, random input generations, statistics for management course (correlation and regression analysis) data presentation techniques. Spread sheet showing the monthly payments with changing interest rate over a period of loan. For example home loan, personal loan.(Using excel)

3. Variable declaration, conditional statements, iteration and result presentation, retrieving of data from the VBA application.

4. Understanding of a database, design elements, creation of a database. Retrieving of data from VBA. Importance of storing data, managing and data mining. Introduction of SPSS package for predictive analytical software.

5 Prepare presentations for mini projects assigned for course work of first semester

References

1. Courter, Mastering Microsoft Office for Business Professional, Techmedia, 2003.
2. Alexis Leon, Introduction to Computers with MS Office 2000, TMH, New Delhi, 2000.
3. Mansfield, MS Office, TMH, New Delhi 1999.
4. * Prowess- Corporate Database, Centre for Monitoring Indian Economy(CMIE), Ph.No.040-
55466091-6,email-cmie.hyd@cmie.com www.cmie.com/products/prowess
5. Groff, SQL 2/e, The Complete Reference, TMH, 2003.
6. Sanders, D.H. Computers In Business--An Introduction Mc-Graw-Hill, Tokyo, 1983

7. Efraim Turban, R. Kelly Rainer, Jr., Richard E. Potter, Introduction to Information Technology,
Second Edition, John Wiley & Sons, Inc., 2003.
8. Bayross, PL SQL the Programming Language of Oracle, BPB, 2002.
9. Bayross, Oracle Teach Yourself SQL / PL SQL using Oracle 8i and 9i with SQLj, BPB, 2002.

Semester - II

Financial Management

1 The Finance Function – Objective: Profit or Wealth Maximization and EPS Maximization, An overview of Managerial Finance functions- Time value of money. present value, future value of money and the basic valuation models.

2. Investment decisions: Nature of Capital Budgeting decisions - techniques of capital budgeting: Pay back method, Average rate of return and Time-Adjusted methods: IRR and NPV, profitability index, and excess present value index. Advanced problems and cases in capital budgeting.

3. Cost of Capital: Concept and measurement of cost of capital, Debt vs.Equity, cost of equity, preference shares, equity capital and retained earnings, weighted average cost of capital and marginal cost of capital. Importance of cost of capital in capital budgeting decisions.

4. Capital structure Decisions: Capital structure vs financial structure - Capitalisation, financial leverage, operating leverage and composite leverage. EBIT-EPS Analysis, Indifference Point/Break even analysis of financial leverage, Capital structure theories – The Modigliani Miller Theory –A critical appraisal.

5. Dividend Decisions: Dividends and value of the firm - Relevance of dividends, the MM hypothesis, Factors determining Dividend Policy-dividends and valuation of the firm-the basic models. Declaration and payment of dividends. Bonus shares. Rights issue, share-splits, Walter Model and Gordon Model.

6. Working Capital Management, components of working capital, gross vs. net working capital, determinants of working capital needs, the operating cycle approach. Planning of working capital, .Financing of working capital through Bank finance and Trade Credit.

7. Management of current assets –I: Management of cash,– Basic strategies for cash management, cash budget, cash management techniques/processes. Marketable securities: characteristics, selection criterion, Marketable security alternatives. Management of receivables - Management of inventory – credit policies.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit

References

1. Brigham and Ehrdhart: "***Financial Management Text and Cases***", Cengage Learning, New Delhi.
2. I.M Pandey: "***Financial Management***", 9/e, Vikas Publishing, 2004

3. M.Y Khan, P K Jain: "***Financial Management-Text and Problems***", Tata McGraw Hill, New Delhi. 2003
4. James C.VanHorne: "***Financial Management and Policy***", Pearson Education, 2004
5. Srivatsav, RM: "***Financial Management***", Himalaya Publishing House, Mumbai.
6. Chakraborty, Bhattacharya, Rao and Sen: "***Financial Management and Control***", Macmillan India Limited, 2003
7. John J. Hampton: "**Financial Decision Making-Concepts, Problems and Cases"**, Prentice Hall .2003
8. Sudhindra Bhat: "***Financial Management Principles and Practice***", Excel Books, New Delhi, 2007
9. Pradeep Kumar Sinha: "***Financial Management Tools and Techniques***", Excel Books, New Delhi.
10. S.N. Maheswari: "***Financial Management***", Vikas Publishers, New Delhi, 2003.
11. Bhabatosh Banerjee: "***Fundamentals of Financial Management***", PHI Learning Private Limited, New Delhi, 2008.
12. CA.C. Rama Gopal: "***Financial Management***", New Age International Publisher, New Delhi, 2008.

Marketing Management

1. Introduction to Marketing: Needs, Wants, Demands, Products, Exchange, Transactions, Market, Marketing, Production Concept, Product Concept, Sales Concept, Marketing Concept, Societal Marketing Concept, Indian Marketing Environment. Role and functions of marketing department.
2. Market Research: Concepts in Demand, Market research – Forecasting and Measurement – Market data analysis.

3. Functions of Marketing: Market Segmentation and Targeting – Positing functional strategies – Identification of Market segments - marketing strategies.

4. Product Management: Product Life Cycle, Product mix and line – Branding and classification. New Product Development - Market Testing, Commercialization.

5. Pricing Strategy: Objectives, Methods and processes of pricing, Factors influencing the pricing. Adopting price, initiating the price cuts, imitating price increases, Responding to Competitor's price changes.

6. Distribution Management and Sales Promotion: Sales Techniques for Consumer/Industrial clientele-Channel Function and Flows, Channel Levels, Channel Management Decisions - The growth and trends in Wholesaling - Sales force Management – Promotional mix – communication strategies.

7. Retail Management: Nature and Significance - concepts – types – retail store management and merchandising – challenges and strategies.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit.

References:

1. Phillip Kotler: "***Marketing Management***", 11/e, Pearson Publishers, New Delhi, 2003
2. Boone and Kurtz: "***Principles of Marketing*** ", Cengage Learning, New Delhi.
3. Rajan Saxena: "***Marketing Management***, 2/e, Tata McGraw Hill, New Delhi, 2008.
4. Tapan K Panda: "***Marketing Management Text and Cases***", Excel Books, New Delhi.
5. VS Ramaswamy, S.Namakumari:, "***Marketing Management***", 3/e, Macmillan, New Delhi, 2003
6. Karunakaran: "***Marketing Management***", Himalaya Publishing House, Mumbai.
7. M.Govindarajan: "***Marketing Management, Concepts, Cases, Challenges and Trends***", PHI Private Limited, New Delhi, 2007.
8. T.N.Chhabra, SK.Grover: "***Marketing Management***", Dhanpat Rai and Co., New Delhi,2009.

9. paul Baines, Chris Fill, Kelly Page: "***Marketing***", Oxford University Press, New Delhi, 2009.
10. Arun Kumar, Meenakshi N: "***Marketing Management***", Vikas Publishing House Private Ltd., 2008.

Human Resource Management

1. HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- Role of HRM - HR policies, Strategies to increase firm performance - Role and position of HR department - HRM at global perspective.

2. Investment perspectives of HRM: HR Planning - Recruitment and Selection, Tests and Interview Techniques - Training and Development – retention - Job Analysis. HRD concepts – mechanisms – MDPs.

3. Performance Evaluation: importance – methods – traditional and modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments

4. Salary and Wage Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- - Incentive Payment Systems.

5. Managing Industrial Relations- Trade Unions-Employee Participation Schemes- Collective Bargaining-Managing Knowledge Work force –Grievances and disputes resolution mechanisms.

6. Safety and welfare management: Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms – types of incentives. Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

7. HR accounting and auditing: Nature and significance – Human resource accounting practices and standards – problems – HR audit - process – HRIS - methods.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit.

References

1. Gary Dessler: "***Human Resources Management***", PHI Private Limited, New Delhi, 2007.
2. K Aswathappa: "***Human Resource and Personnel Management***", Tata McGraw Hill, New Delhi, 2007.
3. Subba Rao P: "***Personnel and Human Resource Management-Text and Cases***", Himalaya Publications, Mumbai.
4. Muller_Camen. Croucher and Leigh: "***Human Resource Management- A Case Study Approach***", JAICO Publishing, Delhi.
5. Scott Snell and George Bohlander: "***Human Resource Management***", Cengage Learning, 2007.

6. Deepak Kumar Bhattacharya: "***Human Resource Management***", Excel Books, New Delhi.
7. S.Seetharaman, B.Venkateswara Prased: "***Human Resource Management***", SCITECH Publication (India) Limited, Hyderabad, 2007.
8. Gary Dessler, Biju Vrkkey: "***Human Resource Management***", Pearson Education,
   New Delhi, 2009
9. Uday Kumar Haldar: "***Human Resource Development***", Oxford University Press,New Delhi, 2009.
10. Iain Henderson: "***Human Resource Management***", Universities Press (India) Private Limited, Hyderabad, 2008.
11. Shashi K Gupta, Rosy Joshi: "***Human Resource Management and Organizational Behavior***", Kalyani Publications, Hyderabad, 2007.
12. Biswanath Ghosh: "***Human Resources Development and Management***", Vikas Publishing House Private Limited, New Delhi, 2008.

Production and Operations Management

1. Introduction: Overview of Production and Operations Management (POM) Function, Historical Development of POM, POM scenario Today.

2. Product and Process Design: Product and Process Development, Manufacturing Process Technology, CAD/CAM, Value Analysis.

3. Facilities Management: Location of Facilities, Layout of Facilities, Optimization of Product/Process Layout, Flexible Manufacturing and Group Technology.

4. Aggregate Planning: Preparation of aggregate demand Forecast, Specification of Organizational Policies for Smoothing Capacity Utilization, Determination of feasible Production Alternatives and Determination of Optimal Production Strategy.

5. Scheduling: Scheduling In Job, Shop Type Production, Shop- Loading, Assignment and Sequencing, Scheduling In Mass, Continuous and Project Type Production, Line balancing Lob, Methods of Production Control.

6. Work Study : Method Study, Work measurement, Work Design, Job Design, Work Sampling, Industrial Engineering Techniques-Productivity: Basic Concepts, Productivity Cycle, Productivity Engineering and Management, Total Productivity Model.

7. Quality management: Economics of Quality Assurance Inspection and Quality Control, Acceptance Sampling, Theory of control charts, control charts for variables and control charts for attributes -Total Quality Management - ISO 9000 series standards, Six Sigma

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit.

References:

1. Chase, Aquilano, Jacobs: "***Operations Management for Competitive Advantage***", Tata McGraw Hill, New Delhi, 2007
2. Elwood S.Buffa and Rakesh K.Sarin: "***Modern Production/Operations Management***", Wiley India, New Delhi, 2008.
3. Aswathappa K: "***Production and Operation Management***", Himalaya Publishing House, Mumbai.
4. James R.Evans and David A. Collier: "***Operations Management*** ", Cengage Learning India Private Limited, New Delhi,2009.
5. R. Panneeselvam: "***Production and Operations Management*** ", PHI Learning Private Limited, New Delhi, 2009.
6. SN Chary: "***Production and Operations Management***", Tata McGraw Hill, New Delhi, 2008.

7. Mahadevan: "***Operations Management***", Pearson Education, New Delhi.
8. Upendra Kachru: "***Production and Operations Management-Text and Cases***", Excel Books, New Delhi.
9. Nair NG: "***Production and Operations Management*** ",Tata McGraw Hill, New Delhi, 2009.
10. William J Stevenson: "***Operations Management***", Tata McGraw Hill, New Delhi, 2009.

Organizational Behavior

1. Introduction - Nature and scope – linkages with other social sciences - Individual Roles and Organizational Goals - Perspectives of Human Behavior, Approach to Organizational behavior - models of organizational behavior.

2. Perceptual Management**:** nature - Process – selection, organization and interpretation – Influencing factors -Motivation – Concepts - Needs and Motives and theories. Leadership and Motivating people - Leadership Theories. Attitudes and Values: formation - types – changes and behavior modification techniques.

3. Personality Development: Nature - Stages, Determinants of Personality, - Johari Window - Transactional Analysis, Learning Processes - theories, Creativity and Creative Thinking. Leadership – nature – skills.

4. Decision Making Process**:** Behavioral Dimensions, Groups and their formation - Group Dynamics, Informal Organizations, Group versus Individual Interaction.

5. Inter-Personal Communication: Listening, Feedback, Collaborative Processes in Work Groups, Team Building, Team Decision Making, Conflict Resolution in Groups and Problem Solving Techniques.

6. Organizations**:** Taxonomy, Elements of Structure, Determinants of Structure, Functional Aspects of Structure, Role Impingement, Stress in Organization. Principles Underlying the Design of Organizations, Organizational Culture, Power and Authority.

7. Organizational Development**:** Goals, processes, change – resistance to change – Nature of OD - interventions, OD techniques and OD applications.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit.

References

1. K.Aswathappa: "**Organizational Behavior-Text, Cases and Games**", Himalaya Publishing House, New Delhi, 2008,
2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "***Organizational Behavior***", Tata McGraw Hill Education, New Delhi, 2008.
3. Jerald Greenberg and Robert A Baron: "***Behavior in Organizations***", PHI Learning Private Limited, New Delhi, 2009.
4. Pareek Udai: "***Understanding Organizational Behavior***", Oxford University Press, New Delhi, 2007.
5. Jai B.P.Sinha: "***Culture and Organizational Behavior***", Sage Publication India Private Limted, New Delhi, 2008.

6. Sharma VS, Veluri: "***Organizational Behavior***", JAICO Publishing House, New Delhi, 2009.
7. Slocum,n Helireigel: "***Fundamentals of Organizational Behavior***", Cengage Learning India, New Delhi, 2009.
8. Jennifer M.George and Gareth R. Jones: "***Understanding and Managing Organizational Behavior***", Pearson Education, New Delhi, 2009.
9. Schermerhorn, Hunt and Osborn: "***Organizational Behavior***", Wiley India Limted, New Delhi, 2007.
10. GregoryMoor head, Ricky W.Grif fin: "***Organizational Behavior***", Biztantra, New Delhi, 2009.

Research Methodology

1. Introduction : Nature and Importance of research, The role of business research, aims of social research, research process, pure research vs. applied research, qualitative research vs quantitative research, exploratory research, descriptive research and experimental research, ethical issues in business research.

2. Data Base: Discussion on primary data and secondary data, tools and techniques of collecting data. Methods of collecting data. Sampling design and sampling procedures. Random Vs. Non-random sampling techniques, determination of sample size and an appropriate sampling design.

3. Measurement concepts: Measurement and Scaling concepts, attitude measurement, questionnaire design, Psychometric, psychological and social instruments used in management research. Levels of measurement and types of scales. Criteria for good measurement.

4. Research Design: Meaning of Research Design. Functions and goals of Research Design, characteristics, phases, design for different types of research, outlining a research proposal, pilot study and developing a case study

5. Data Analysis : Editing and coding, transform raw data into information, basic data analysis, descriptive statistics.U*nivariate Statistics* – stating a hypothesis, hypothesis testing, discriminate analysis, factor analysis, cluster analysis, conjoint analysis and content analysis.

6. Survey research and field work: media used to communicate with respondents, personal interviews, telephone interviews, self-administered questionnaires, selection of an appropriate survey research design, the nature of field work, principles of good interviews and field work management.

7. Multivariate Analysis: Nature of multivariate analysis, classifying multivariate techniques, analysis of dependence, analysis of interdependence. Bivariate analysis-tests of differences-t test for comparing two means and z-test for comparing two proportions and ANOVA for complex experimental designs.

8. Case Study: Compulsory. Relevant cases have to be discussed in each unit

References

1. C.R. Kothari: "***Research Methodology***", Wishwa Prakashan, 2009.
2. Panneerselvam R: "***Research Methodology***", PHI Learning Private Limited, New Delhi, 2009.
3. Willam G.Zikmund: "***Business Research Methods***", Cengage Learning, New Delhi, 2006.

4. S.Shajahan: "***Research Methods for management***", JAICO Publishing House, New Delhi, 2009.
5. Battacharya, DK: "***Research Methodology***", Excel Books, New Delhi.
6. Alan Bryman, Emma Bell: "***Business Research Methods***", Oxford University Press, New Delhi, 2008.
7. Cooper R.Donald and Schindler S. Pamela: "***Business Research Methods***", 9/e, Tata MCGraw Hill, New Delhi.
8. CR Kothari: "***Research Methodology Methods and Techniques***", New Age International Publishers, New Delhi, 2009.
9. Ajai S.Gaur and Sanjaya S.Gaur: "***Statistical Methods for Practice and Research***", Sage Publications, New Delhi, 2007.
10. Sachdeva: "***Business Research Methods***", Himalaya Publishing House, Mumbai

Introduction to Technology Management

1. Introduction to Technology Management –Definition – Concept of creativity – Components – Features – Classification of Technology – Concept and Nature of Technology Management- Drivers of MOT- Significance and Scope of MOT- Role of Chief Technology Officer – Responding to Technology challenges.

2. Technology Policy – Determinants of Nation's Capability – Role of Government – Science and Technology policy – Status of Technology in India – Future of India – Technology Strategy – Formulation of Technology Strategy – Technology innovation Strategy.

3 Technology Planning and Strategy Tools – Technology Planning – Tools for Company Technology Analysis – Tools for industry Technology Analysis – Trajectories of Technology

4. Technology Acquisition - Methods Acquisition - Internal Development - External acquisition Sources - Acquisition decisions - Technology Acquisition trends – Technology exploitation decisions - Technology appropriation.

5 Process Innovations – Concept and types of process - Process Management Concerns - Types of Process innovations- Process improvement techniques – Organizing for improvements

6. Technology Transfer – Definition – Classification and Significance - Elements of transfer process - Types of Technology transfer - package – Modes of transfer - Channels of Technology flow - Routes of technology transfer- Effective transfer and Pricing of technology transfer – Price negotiation- Technology transfer agreements.

7. Technology Diffusion – Concept of Diffusion - Integrated Diffusion Strategy - Influencing factors - Innovation adoption - Diffusion strategies - Community effects and network externalities – Distribution of Adopters- Crossing the Chasm – Market dynamics.

8. Technology Absorption and Deployment – Technology Absorption – Influencing factors - Deployment strategies - Corporate Venturing - Benefits and Drawbacks of Corporate Venturing – Spin-off Companies

References:

1. Rastogi P.N: "***Management of Technology and Innovation***", Sage Publications, New Delhi, 2009.
2. Scott Shane: "***Technology Strategy for Managers and Entrepreneurs***", Pearson Education, New Delhi, 2009.

3. CSG Krishnamacharyulu, Lalitha Ramakrishnan: "***Management of Technology***", Himalaya Publishing House Private Limited, New Delhi, 2008.
4. White and Bruton: "***The Management of Technology and Innovation***", Cengage Learning India, New Delhi, 2009.
5 Tarek Khalil, "***Management of Technology—The Key to Competitiveness and Wealth Creation***",McGraw Hill, Boston, 2000.
6. P.N.Rastogi, "***Managing Creativity***", Macmillan India Ltd, 2003.
7. William L Miller and Longdon, Morris, "***Fourth Generation R & D***", John Wiley & Sons Inc.
8. Pradip N Khandwalla: "***Lifelong Creativity—An Unending Fest***", TMH, 2004.
9. Pradip N Khandwalla: "***Corporate Creativity***", TMH, 2003.
10. George Reynolds: "***Ethics in Information Technology***", Cengage Learning, New Delhi, 2009

Information Technology Lab-II (100% Lab)

Course Objective

1 Improve the understanding and usage of information technology in business environments.

Course Details:

1. Illustrate numerical mathematical simulations from Statistics for Management course.
2. Project Management and resource planning using MS Project

3. Data Collection and analyzing techniques for quality management (Charts, flow diagrams for methodologies like six sigma/lean mfg etc)

4. Basic structure of PLSQL procedural language, achieving functionality using PLSQL. Importance of Database systems in business environments and knowledge management.

5. Prepare presentations for mini projects assigned for course work of second semester.

6. Introduction of online financial services example online trading systems, Reuters, Bloomberg, websites of regulatory institutions like SEBI. Understand how a major industrial system (Reuters) works in trading, searching and downloading financial data

References

1. Scott Urman, "***Oracle 8i-PL SQL Programming****"*, TMH, 2000.
2. Loney, "***Oracle 8i—The Complete Reference****"*, TMH, 2000.
3. Loney, "***Oracle 9i—The Complete Reference"***, TMH, 2002.
4. Bayross, "***Oracle Teach Yourself SQL / PL SQL using Oracle 8i and 9i with SQLj"***, BPB, 2002.
5. Abbey, "***Oracle 8i—A beginner's Guide"***, TMH, 2000.
6. Courter, "***Mastering Microsoft Project"***, BPB, 2002.
7. Pyron, "***Using MS Projec"t***, Techmedia, 2002.
8. Bayross, "***PL SQL the Programming Language of Oracle"***, BPB, 2002.

ACADEMIC REGULATIONS & COURSE STRUCTURE

For

MBA (Regular)

(Applicable for batches admitted from 2016-2017)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India

JAWAHARLAL NEHRU TENHNOLOGICAL UNIVERSITY, KAKINADA: KAKINADA

School of Management Studies

Course Structure MBA (Regular) 2016-2017

(Effective for the students admitted into first year from the academic year 2016-2017)

Semester - I

Subject	Title	Marks	Credits
C-101	Principles of Management	100	3
C-102	Managerial Economics	100	3
C-103	Accounting for Managers	100	3
C-104	Managerial Communication & Soft skills	100	3
C-105	Business Environment	100	3
C-106	Quantitative Analysis for Business Decision	100	3
C-107	IT – LAB	100	3

Semester - II

Subject	Title	Marks	Credits
C-201	Financial Management	100	3
C-202	Human Resource Management	100	3
C-203	Marketing Management	100	3
C-204	Production and Operations Management	100	3
C-205	Business Research Methods	100	3
C-206	Organizational Behavior	100	3
C-207	Mini Project *	50	2
	Seminar on Mini Project	50	2

Semester - III

Subject	Title	Marks	Credits
C-301	Strategic Management	100	3
C -302	Legal Aspects of Business	100	3
C -303	Business Ethics & Corporate Governance	100	3
E -301	Elective – 1	100	3
E-302	Elective – 2	100	3
E-303	Elective – 3	100	3
E-304	Elective – 4	100	3

Semester - IV

Subject	Title	Marks	Credits
C -401	Logistic and Supply Chain Management	100	3
C -402	Entrepreneurship Development	100	3
E-401	Elective – 5	100	3
E-402	Elective – 6	100	3
E-403	Elective – 7	100	3
E-404	Elective – 8	100	3
	Major Project & Comprehensive Viva	Grade	8
Total Marks / Credits		**2700**	**90**

Elective: The student has to choose any **ONE** Specialization from the following areas in the beginning of III Semester

III SEMESTER

HR

S. no	SUBJECT TITLE
1	Leadership Management
2	Compensation and Reward Management
3	Performance Management
4	Strategic Human Resource Management

FINANCE

S. no	SUBJECT TITLE
1	Security Analysis & Portfolio Management
2	Banking and Insurance Management
3	Advance Management Accounting
4	Strategic Financial Management

MARKETING

S. no	SUBJECT TITLE
1	Consumer Behavior
2	Retail Management
3	Customer Relationship Management
4	Strategic Marketing Management

SYSTEMS

S. no	SUBJECT TITLE
1	E-Business
2	RDBMS
3	Web Designing
4	System Analysis & Design

IV SEMESTER

HR

	SUBJECT TITLE
Elective-5	Organizational Development & Change Management
Elective-6	Global HRM
Elective-7	Labor Welfare & Legislation
Elective-8	Management of Industrial Relations

FINANCE

	SUBJECT TITLE
Elective-5	Financial Markets and Services
Elective-6	Global Financial Management
Elective-7	Risk Management
Elective-8	Tax Management

MARKETING

	SUBJECT TITLE
Elective-5	Services Marketing
Elective-6	Promotional Distribution Management
Elective-7	Global Marketing Management
Elective-8	Supply Chain Management

SYSTEMS

	SUBJECT TITLE
Elective-5	Business Intelligence
Elective-6	Enterprise Resource Planning
Elective-7	Cyber Laws & Security
Elective-8	Information Systems Audit

*__Mini Project Report__

The student should undergo survey based fieldwork under the guidance of Internal Faculty and submit the report before the completion of II Semester End Examinations.

Principles of Management

Unit 1:

Introduction of Management: Management: Definition – Importance – Managerial Roles – Functions of management – Classical theory – Scientific management - Administrative theory – Behavioral Theory – Management science – Integrative perspective – System theory – Socio – technical theory – Contingency theory – Comparing theories

Unit 2

Planning and Organizing: Nature and Definition of Planning – Principles of Planning – Objectives of planning – Planning process – Types of plans – Benefits and pitfalls of planning.

Principles of organizing – Organization levels – Organizational designs and structure – Line and staff organizations – Approaches – Delegation of authority – Factors affecting delegation of authority – Span of management – Centralization and decentralization of Authority.

Unit 3

Directing and controlling: Definition of Co-ordination – Significance and principles of Co-ordination– Leadership behavior and styles – Leadership in cross cultural environment.

Nature and importance of controlling – Controlling process – Requirements of effective control – Establishing controlling system – Controlling techniques.

Unit 4

Decision making: Meaning of decision – types of decisions – Rationale decision making process – Models of decision making – Problem solving and decision making – increasing participation in decision making – Vroom's Participative decision making model – challenges and problems in decision making

Unit 5

Contemporary issues in Management: MBO - Management By Walking Around – Out of the Box Thinking – Balanced Score Card –Time Management –BPOs – Stress Management causes and remedies – JIT – TQM – Six Sigma – CMM levels

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES:

1. Kumar ,Rao, Chhalill: Introduction to Management Science . Cengage Publications, New Delhi
2. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.
3. Harold Koontz, Heinz Weihrich, A.R.Aryasri, Principles of Management, TMH, 2010.
4. V.S.P.Rao, Management Text and Cases, Excel, Second Edition, 2012.
5. K.Anbuvelan, Principles of Management, University Science Press, 2013.
6. Neeta Baporikar, Case Method – Cases in Management, Himalaya Publishing House (HPH) 2009.
7. Deepak Kumar Bhattacharyya, Principles of Management-text and cases, Pearson, 2012.

Managerial Economics

UNIT 1:
Introduction to Managerial Economics: Definition, Nature and Scope, Relationship with other areas in Economics, The role of managerial economist. Concept of opportunity cost, Incremental concept, time Perfective, Discounting Principle , Risk & uncertainty.

UNIT 2:
Demand Analysis: Elasticity of demand, types and significance of Elasticity of Demand - Measurement of price Elasticity of Demand – Need for Demand forecasting, forecasting techniques, law of Supply, Elasticity of Supply.

UNIT 3:
Supply and Production Analysis: Production function, Marginal Rate of Technical Substitution, Production function with one/two variables, Cobb-Douglas Production Function, Returns to Scale and Laws of returns.

UNIT 4:
Cost theory and estimation: Cost concepts, determinants of cost, cost – output relationship in the short run and long run – Modern development in cost theory – Saucer shaped short – run Average cost curves – Average total cost curve – Cost - Volume – Profit analysis

UNIT 5:
Market Structure and Pricing practices: Features and Types of different Markets – Price- Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly both in the long run and short run. Pricing methods in practice – Bain's limit pricing theory - Managerial Theories of a firm – Marris & Williams Models.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Paul, Koushil: "**Managerial Economics**", Cengage Learning, New Delhi,
2. Siddiqui S A,Siddiqui A S: "**Managerial Economics**", and Financial Analysis", New Age International Publishers, New Delhi, 2008.
3. Vanita Agarwal: "**Managerial Economics**", Pearson, New Delhi, 2013.
4. Dominick Salvatore: "**Managerial Economics**", Oxford University Press, New Delhi,2010.
5. D.L. Ahuja: "**Managerial Economics**", S. Chand & Company ltd,New Delhi-55.
6. O'Sullivan, Sheffrin, Perez "Micro Economics: Principles, Applications and Tools", Pearson Education.
7. Mithani D M: ''**Managerial Economics**", Himalaya Publishing House, Mumbai, 2008.
8. Atmanand: "**Managerial Economics**", Excel Publications. New Delhi, 2012.
9. Varshney, R.L and Maheswari, K L: ''**Managerial Economics**", Sultan Chand and Sons, New Delhi, 2002.
10. Narayanan Nadar E, Vijayan S: ''**Managerial Economics**", PHI Private Limited, New Delhi,2009.

Accounting for Managers

UNIT 1

Accenting process: Definition of accounting - Accounting Concepts and conventions - Accounting Cycle - Classification of accounts - Accounting equations – Static and dynamic nature of accounting - Users of accounting information - Books of original entry, ledger - Preparation of Trial balance

UNIT-2

Final Accounts: Preparation and Presentation of income statement - Balance Sheet with Adjustments - Accounting standards - Preparation and Presentation of Company Final Accounts – Limitations of Financial Statements

UNIT-3

Financial Analysis: The scope and purpose of financial analysis - financial statement analysis - Ratio analysis – liquidity, activity, structural, coverage and profitability ratios - Funds flow analysis - concepts of funds; ascertaining funds from operations ; Sources of funds - Uses of funds - Preparation and analysis of funds flow statement and cash flow statement.

UNIT-4

Cost accounting concepts: Methods of Costing, Techniques of Costing - Role of Cost accounting - Elements of cost - Financial accounting Vs Management Accounting - Basic Cost concepts - Determination of product cost - Preparation of cost sheet under different cost heads

UNIT-5

Cost behavior and Decision making: Behavioural classification of costs and methods for calculation of fixed, variable and semi variable costs - CVP analysis and decision making - Break Even analysis- Key factor distribution & analysis - Optimization of Product mix - Make or Buy decisions - Capacity utilization - Plant shutdown or continue decision CVP under conditions of uncertainty - sensitivity analysis.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Vijaya Kumar.P, Ravindra P.S., Kiran Kumar V: "**Accounting for Managers**", Himalaya Publishing House, New Delhi, 2013
2. Shankarnarayana, Ramanath: "**Finanacial Accounting for Management**", Cengage Learning, New Delhi.
3. Ramachandran N, RamKumar Kakani: **Financial Accounting for Management**", McGraw Hill – 2013.
4. Maheshwari, Maheashwari and Maheshwari, "**Financial Accounting**", Vikas publishing House, New Delhi,2013
5. Amberish Gupta:"**Financial Accounting for Management**", Pearson Education, 2012.
6. Dr. Jawahar Lal: "**Accounting for management**", Himalaya Publishing house, NewDelhi, 2012.
7. Asish K. Bhattacharyya: "**Essentials of Financial Accounting**", PHI Learning, New Delhi, 2012.
8. Dr. V.R.Palanivelu: "**Accounting for Management**". University Science Press, New Delhi, 2009.
9. Ashok Banerjee: "**Financial Accounting**", a managerial Emphasis, Excel books, New Delhi, 2012.

Managerial Communication & Soft Skills

UNIT 1

Role of Communication in Business: Objective of Communication – The Process of Human Communication – Media of Communication - Written Communication - Oral Communication - Visual Communication - Audio Visual Communication – Silence - Developing Listening Skills – Improving Non-verbal communication skills – Cross Cultural Communication – problems and challenges.

UNIT 2

Managing Organization Communication: Formal and Informal Communication - Intrapersonal Communication – Models for Inter Personal Communication - Exchange Theory.

UNIT 3

Managing Interpersonal Communication: Inter-Personal communication – Role of Emotion in Inter Personal Communication – Communication Styles – Barriers to Communication – Gateways to Effective Interpersonal Communication.

UNIT 4

Business Writing Skills: Significance of Business Correspondence - Essentials of Effective Business Correspondence - Business Letter and Forms - Meeting - Telephone Communication – Use of Technology in Business Communication. Report Writing – Meaning and Significance: Structure of Reports - Negative, Persuasive and Special Reporting: Informal Report – Proposals. Formal Reports.

UNIT 5

Presentation skills – Techniques of Presentation – Types of Presentation – Video Conferencing and formats – Interview – formal and informal – Interview techniques –Communication etiquettes.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.
2. Kuberudu B and Srinivasa Krishna K: "***Business Communication and Soft Skills***", Excel Books, 2008.
3. Meenakshi Rama: "***Business Communication***", Oxford University Press, New Delhi
4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai
5. Paul Turner: "***Organisational Communication***", JAICO Publishing House, New Delhi.
6. SathyaSwaroopDebasish, Bhagaban Das" "***Business Communication***", PHI Private Limited, New Delhi, 2009.
7. R.K.Madhukar: "**Business Communication**", Vikas Publishing House, New Delhi, 2012.
8. Kelly M Quintanilla, Shawn T.Wahl:"**Business and Professional Communication**", SAGE, New Delhi, 2012.
9. Sangita Mehta, NeetyKaushish: "**Business Communication**", University Science Press, New Delhi, 2010.
10. Anjali Ghanekar: "**Business Communication Skills**", Everest Publishing House, New Delhi, 202011

Business Environment

UNIT 1

Business Environment: Importance at national and international level – problems and challenges – factors both internal and external influencing business environment. Industrial policies since independence and their significance – regulatory and promotional framework - Five-year plans and their importance.

UNIT 2

Structure of Indian economy: Nature and significance – Economic systems – structure of Indian industry – Economic reforms in various sectors – nature – challenges – social justice – Disinvestment mechanism – problems and procedures – Sickness in Indian industry, competition Act 2002.

UNIT 3

Fiscal Policy: Nature and significance – public revenues – expenditure- debt, development activities allocation of funds – Critical analysis of the recent fiscal policy of Government of India - Balance of Payments - Nature – Structure – major components – Causes for disequilibrium in Balance of Payments – Correction measures.

UNIT 4

India's Trade Policy: Nature – Magnitude and direction of Indian international trade – problems – bilateral and multilateral trade agreements. International business environment: Nature – significance– challenges and mechanisms. WTO: Agreements in the Uruguay round including TRIPS, TRIMS and GATS – disputes settlement mechanism – dumping and antidumping measures.

UNIT 5

Legal Frame: special features of the SICA (special provisions) 1985, BIFR, Consumer protection act 1986, Environmental laws (pertaining to the control and prevention of Air and Water pollution) and the Essential Commodities Act 1955.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Shaikh Saleem: "**Business Environment**", Pearsons, New Delhi,
2. Veena Keshav Pailwar: "**Economic Environment of Business**", PHI Learning, New Delhi, 2012
3. Rosy Joshi, Sangam Kapoor: "**Business Environment**", Kalyani Publishers, New Delhi, 2011.
4. Aswathappa K: "**Essentials of Business Environment**", Himalaya Publishing House, New Delhi, 2011.
5. Vivek Mittal: "**Business Environment Text and Cases**", Excel Books New Delhi, 2011.
6. Sundaram and Black: "***International Business Environment Text and Cases***", PHI Private Limited, New Delhi.
7. Avid W Conklin: "***Cases in Environment of Business***", Sage Publication India Private Ltd, New Delhi.
8. Raj Kumar: "**International Business Environment**", Excel Publication, New Delhi, 2012.
9. Palle Krishna Rao: "***WTO-Text and Cases***", Excel Publication, New Delhi.
10. Government of India, ***Latest Economic Survey Report***.

Quantitative Techniques for Business Decisions

UNIT 1

Basic Mathematical & Statistical Techniques**:** Linear, Quadratic, Logarithmic and Exponential Functions- Permutations and Combinations – Matrices - Elementary operations of matrices. Measures of Central Tendency – Measures of Dispersion –Simple Correlation and
Regression Analysis
Concept of Probability- Probability Rules – Joint and Marginal Probability – Baye's
Theorem- Probability Distributions- Binomial, Poisson, Normal and Exponential Probability Distributions.

UNIT 2

Introduction to Decision Theory: Steps involved in Decision Making, different environments in which decisions are made, Criteria for Decision Making, Decision making under uncertainty, Decision making under conditions of Risk-Utility as a decision criterion, Decision trees, Graphic displays of the decision making process, Decision making with an active opponent.

UNIT 3

Linear Programming: Formation of mathematical modeling, Graphical method, the Simplex Method; Justification, interpretation of Significance of All Elements In the Simplex Tableau, Artificial variable techniques: Big M method, Two phase method.

UNIT 4

Transportation, Assignment Models & Game theory: Definition and application of the transportation model, solution of the transportation problem, the Assignment Model, Traveling Salesman Problem. Game Theory: Introduction – Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, matrix and arithmetic methods.

UNIT 5

P.E.R.T. & C.P.M. and Replacement Model: Drawing networks – identifying critical path – probability of completing the project within given time- project crashing – optimum cost and optimum duration. Replacement models comprising single replacement and group replacement

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. N.D.Vohra: "***Quantitative Techniques in Management***", Tata-McGraw Hill Private Limited, New Delhi, 2011.
2. J. K. Sharma, "***Operations Research: Theory and Applications***", Macmillan Gupta S.P: "***Statistical Methods***", S. Chand and Sons, New Delhi,
3. Anand Sharma: "**Quantitative Techniques for Business decision Making**", Himalaya Publishers, New Delhi,2012;
4. D P Apte: "***Operation Research and Quantitative Techniques***", Excel Publication, New Delhi, 2013
5. Hamdy, A.Taha: "***Operations Research: An Introduction***", Prentice-Hall of India, New Delhi 2003.
6. Anderson: "**Quantitative Methods for Business**", Cengage Learning, New Delhi 2013
7. Sancheti, Dc & VK Kapoor, "**Business Mathematics**", S Chand and Sons, New Delhi

Information Technology Lab (100% Lab)

UNIT 1

Introduction of various software used for business: Significance in the current business environments - Introduction of software MS Office, SQL.

UNIT 2

Financial modeling: Present value of cash flows, Valuations, Financial ratio analysis, Forecasting, Trend analysis of data, Random input generations

UNIT 3

Statistics for Management - correlation and regression analysis data presentation techniques. Spread sheet showing the monthly payments with changing interest rate over a period of loan. (Using excel)

UNIT 4

Data Collection and analyzing techniques: Chats, Flow diagrams TQM methodologies

UNIT5

Preparation and presentations of Mini projects assigned for course work of first semester.

References:

1. Shelly, Cashman: "Microsoft copies 2007", Cengage Learning, New Delhi. 2012

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY :: KAKINADA

E X A M I N A T I O N B R A N C H, K A K I N A D A

MBA III SEMESTER (R09 REGULATIONS) SUPPLEMENTARY EXAMINATIONS – JAN/FEB, 2016

(2010 TO 2012 ADMITTED BATCHES ONLY)

T I M E T A B L E

T I M E - 10.00 AM TO 1.00 PM

18-01-2016 (Monday)	**20-01-2016 (Wednesday)**	**22-01-2016 (Friday)**	**25-01-2016 (Monday)**	**27-01-2016 (Wednesday)**	**28.01.2016 (Thursday)**	**29.01.2016 (Friday)**	**30.01.2016 (Saturday)**	**01.02.2016 (Monday)**	**02.02.2016 (Tuesday)**	**03.02.2016 (Wednesday)**	**04.02.2016 (Thursday)**
Costs & Management Accounting MB930	Business Law MB931	Strategic Management MB932	Knowledge Management MB933	Elective-1 Services Marketing MB934	Elective-1 Security analysis and Portfolio Management MB936	Elective-1 Global HRM MB938	Elective-1 Data Warehousing and Data Mining MB93A	Elective-2 Advertisement and Brand Management MB935	Elective-2 Financial Institutions and Services MB937	Elective-2 Management of Industrial Relations MB939	Elective2 E-Commerce MB93B

NOTE: (i) If Government declares holiday on any of the above dates, the examinations will be conducted as usual

(ii) Any omissions or clashes in this Time Table may please be informed to the Controller of Examinations immediately.

(iii) The Principals are requested to inform the University, if any other substitute subjects that are not included in the above time table immediately

DATE: 02-01-2016

Controller of Examinations

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

For

MASTER OF BUSINESS ADMINISTRATION

JAWAHARLAL NEHRU TECHNOLOGY UNIVERSITY KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY : KAKINADA(Established by Andhra Pradesh Act No.30 of 2008) Kakinada – 533 003, Andhra Pradesh (India)

ACADEMIC REGULATIONS MBA (Regular) 2013-2014

(Effective for the students admitted into first year from the academic year 2013-2014)

The MBA Degree of the Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the program and fulfill all the requirements for the award of the Degree:

1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above programme shall be made subject to the eligibility, qualifications and specialization prescribed by the University from time to time. Admissions shall be made on the basis of merit rank obtained by the qualifying candidate at ICET examination or at an Entrance Test conducted by the university subject to reservations prescribed by the university from time to time.

2.0 AWARD OF MBA DEGREE

2.1 A Student shall be declared eligible for the award of MBA degree, if he pursues a course of study and completes it successfully for not less than two academic years and not more than four academic years.

2.2 A Student, who fails to fulfill all the academic requirements for the award of the degree within **FOUR** academic years from the year of their admission, shall forfeit his/her seat in MBA course.

3.0 ATTENDANCE

3.1 A candidate shall be deemed to have eligibility to write end semester examinations if he has put in a minimum of 75% of attendance in aggregate of all the subjects.

3.2 Condonation of shortage of attendance up to 10% i.e. 65% and above and below 75% may be given by the College Academic Committee.

3.3 Condonation of shortage attendance shall be granted only on genuine and valid reasons on representation by the candidate

with supporting evidence.

3.4 Shortage of attendance below 65% shall in no case be condoned.

3.5 A candidate shall not be promoted to the next semester unless he fulfills the attendance requirements of the previous semester.

4.0 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for practicals, on the basis of the Internal Evaluation and End Examination

4.1.1 For the theory subjects 60 marks shall be awarded based on the performance in the End Examination. Remaining 40 Internal marks are divided in Two Mid Examinations and taking average for awarding the Internal Marks.

4.1.2 Remaining 40 marks shall be awarded based on Internal Examination. Two Internal Examinations of 40 marks each will be conducted in semester and taking average for awarding the Internal Marks. The Internal Examination will have two components:

i) First 20 marks is Mid examination with duration of 120 minutes. The student has to answer four questions out of four questions.

ii) Remaining 20 marks is allotted for Mini Report (10marks for preparation of Report and 10 marks for presentation in the class room) in the respective subject.

4.2 For practical subjects, 60 marks shall be awarded based on the performance in the End Semester Examinations, 40 marks shall be awarded based on the day-to-day performance as Internal Marks.

4.3 A candidate shall be deemed to have secured the minimum academic requirements in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

4.4 A Candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are

less than 50% and he has failed in the end examination. In such case candidate must re-register for the subject(s) and secure required minimum attendance. Attendance in the re-registered subject(s) has to be calculated separately to become eligible to write the end examination in the re-registered subject(s).

The attendance of re-registered subject(s) shall be calculated separately to decided upon the eligibility for writing the end examination in those subject(s).In the event of taking another chance, the internal marks and end examination marks obtained in the previous attempt are nullified. At a given time a candidate is permitted to re-register for a maximum of two subject(s) in addition to the subjects of a regular semester.

4.5 A Candidate shall be allowed to submit the project report only after fulfilling the attendance requirements of all the semesters.

4.6 The viva-voce examination shall be conducted after completion of the fourth semester end examinations.

4.7 Laboratory examination for MBA course must be conducted with two Examiners, one of them being Laboratory Class Teacher and second examiner shall be other than Class Teacher.

5.0 EVALUATION OF PROJECT WORKS

5.1 A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA.

5.2 Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester.

5.3 Every candidate shall work on projects approved by the PRC of the College.

5.4 A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

The student should prepare a Project Report under the supervision of

a guide from the faculty of management of the concerned college. However, the students who prepare Project Report in the area of systems can also work under the guidance of Faculty member from Computer Science Department.

5.5 Three copies of Project dissertation certified by the Project supervisor shall be submitted to the College/School

5.6 The project report shall be adjudicated by one examiner selected by the University.

The College will submit a 5-member panel who are eminent in that field of study.

5.7 The viva-voce examination of the project report shall be conducted by a board consisting of the External examiner, the Head of the Department and Supervisor. The Candidate should have to secure **Grade A/Grade B/Grade C** in Project viva-voce.

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

5.8 If the candidate fails to secure **Grade A/Grade B/Grade C** in project viva-voce, the candidate will retake the viva-voce examination after three months. If he fails to get **Grade A/Grade B/Grade C** at the second viva-voce examination, he will not be eligible for the award of the degree, unless the candidate is asked to revise and resubmit. If the candidate fails to secure **Grade A/Grade B/Grade C** again, the project shall be summarily rejected.

Grade A: Excellent, Grade B: Good, Grade C: Satisfactory, Grade D: Unsatisfactory

6.0 AWARD OF DEGREE AND CLASS

A candidate shall be eligible for the award of MBA degree if he satisfies the minimum academic requirements in every subject and in his project thesis/dissertation and viva-voce.

First class with Distinction:	70% or more
First class	below 70% but not less than 60%
Second class	below 60% but not less than 50%

7.0 WITHHOLDING OF RESULTS

If the candidate has not paid any dues to the university or if any case of indiscipline is pending against him, the result of the candidate will be withheld. The issue of degree is liable to be withheld in such cases.

8.0 TRANSITORY REGULATIONS

Candidates who have discontinued or have been detained for want of attendance or who have failed after having undergone the course are eligible for admission to the same or equivalent subjects as and when subjects are offered, subject to 4.4.

9.0 GENERAL

9.1 The academic regulations should be read as a whole for purpose of any interpretation.

9.2 In case of any doubt of ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

9.3 The University may change or amend the academic regulations and syllabus at any time and the changes and amendments made shall be applicable to all the students with effect from the date notified by the University.

9.4 Wherever the word he, him or his occur, it will also include she, her and hers.

9.5 There shall be no transfers within the constituent colleges of Jawaharlal Nehru Technological University Kakinada.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project

	(theory or practical) in which the candidate is appearing.	work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and

	the examination.	shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/ Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining

		examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/ year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show cause notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA-533003, Andhra Pradesh (India)
For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- ⇨ Ragging within or outside any educational institution is prohibited.
- ⇨ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs.10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA-533003, Andhra Pradesh (India)
For Constituent Colleges and Affiliated Colleges of JNTUK

Ragging

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Card and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

Jawaharlal Nehru Technological University Kakinada
For Constituent Colleges and Affiliated Colleges of JNTUK

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY

Course Structure MBA (Regular) 2013-2014

(Effective for the students admitted into first year from the academic year 2013-2014)

I SEMESTER

Subject	Title	Marks	Credits
1	Management Theory & Organization Behavior	100	3
2	Managerial Economics	100	3
3	Accounting for Managers	100	3
4	Managerial Communication & Soft Skills	100	3
5	Business Environment	100	3
6	Quantitative Analysis for Business Decision	100	3
7	IT – LAB	100	2

SEMESTER - II

Subject	Title	Marks	Credits
1	Financial Management	100	3
2	Human Resource Management	100	3
3	Marketing Management	100	3
4	Production and Operations Management	100	3
5	Business Research Methods	100	3
6	Business Ethics and Corporate Governance	100	3
7	Mini Project+Seminar on Mini Project	50+50	2+2

SEMESTER - III

Subject	Title	Marks	Credits
1	Strategic Management	100	3
2	Legal Aspects of Business	100	3
3	Retail Management	100	3
4	Elective –I	100	3
5	Elective –II	100	3
6	Elective –I	100	3
7	Elective –II	100	3

SEMESTER - IV

Subject	Title	Marks	Credits
1	Logistic and Supply Chain Management	100	**3**
2	Entrepreneurship Development	100	3
3	Elective –III	100	3
4	Elective –IV	100	3
5	Elective –III	100	3
6	Elective – IV	100	3
7	Major Project & Comprehensive Viva	Grade	8
	Total Marks / Credits	**2700**	**90**

Dual Electives:

The elective papers will be offered in the areas of Marketing, Finance, Human Resource Management (HRM), and Systems. The students should choose any **Two** of the following **elective areas** in the beginning of the third semester of MBA. Specialization will be offered subject to a minimum of 20 students.

Marketing (Elective-I)

I. Product Management
II. Promotion and Distribution Management
III. Services Marketing
IV. Consumer Behavior

Finance (Elective-II)

I. Investment Management
II. Banking and Insurance
III. International Financial Management
IV. Financial Risk Management

HRM (Elective-III)

I. Compensation and Performance Management
II. Management of Industrial Relations
III. Global Human Resource Management
IV. Management of Change and Development

Systems (Elective-IV)

I. E-Business
II. Enterprise Resource Planning
III. Information Systems Audit & Control
IV Software Project Management

SYLLABUS

I – I	L	P	Credits
	4	-	3
MANAGEMENT THEORY AND ORGANIZATIONAL BEHAVIOR			

UNIT -1.

Nature of Management– definitions, scope and importance - managerial roles and functions–development of management thought - approaches to management - Managing for competitive advantage - the Challenges of Management - Corporate Social responsibility. Planning: Nature and principles of planning - The Planning Process-MBO. Decision-making: role-significance- process-decision tree analysis – tools and techniques. Co-ordination-principles.

UNIT -II

Nature of organizing - principles – organization levels – types - and span of management- Organizational design and structure, approaches–delegation of authority - centralization and decentralization of authority – responsive organization. Controlling**-** Nature and importance – process – feedback system – Requirement for effective control – control techniques.

UNIT -III

Organizational behavior: Nature and scope – linkages with other social sciences - Individual perspective – Perception and process- Values, Attitudes- Learning and learning theories– Personality, types and models – Johari window – Transitional analysis-Approach to Organizational behavior - models of organizational behavior - Organizational culture and development.

UNIT -IV

Motivation – theories - Leadership – approaches to leadership – leadership behavior and styles – leadership skills – leadership in cross-cultural environment – women and corporate leadership –Group dynamics – group formation and development -conflict management and negation skills.

UNIT-V

Organizational culture and effectiveness: Definition – creating organizational culture- approaches to organizational culture – learning of organizational culture – measurement of organizational culture – organizational effectiveness – nature and importance.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. William, Tripathy: "**MGMT (including instructor recourses)**", Cengage Learning, New Delhi, 2013
2. Dr.P.Subba Rao and Prof. N.Sambasiva Rao:"**Management and Organizational Behaviour - (Text and Cases)**", Himalaya Publishing House, Mumbai
3. Griffin, Moorhead: "Managing Organisational Behaviour", Cengage Learning, New Delhi.2013.
4. Jerald Greenberg and Robert A Baron: "***Behavior in Organizations***", PHI Learning Private Limited, New Delhi, 2009.
5. Mullins, Laurie: "**Management and Organisational Behaviour**", Pearson Education, New Delhi, 2013
6. Jennifer M.George and Gareth R. Jones: "***Understanding and Managing Organizational Behavior***", Pearson Education, New Delhi, 2009.
7. Meenakshi Gupta: "***Principles of Management***", PHI Private Limited, New Delhi, 2009.
8. J S Chandan: "***Management Theory and Practice***", Vikas Publishing House Limited, 2009
9. Anil Bhat, Arya Kumar: "***Management***", Oxford University, New Delhi, 2008.
10. Jai B.P.Sinha: "***Culture and Organizational Behavior***", Sage Publication India Private Limited, New Delhi, 2008.
11. K.Aswathappa: "**Organizational Behavior-Text, Cases and Games**", Himalaya Publishing House, New Delhi, 2008,
12. Gupta R S, Sharma B D Bhalla N S: "**Principles and Practice of Management**", Kalyani Publications, Hyderabad, 2008.
13. PareekUdai: "***Understanding Organizational Behavior***", Oxford University Press, New Delhi, 2007.

I – I	L	P	Credits
	4	-	3
MANAGERIAL ECONOMICS			

UNIT-I

Introduction to Managerial Economics: Definition, Nature and Scope, Relationship with other areas in Economics, The role of managerial economist. Concept of opportunity cost, Incremental concept, time Perfective, Discounting Principle , Risk & uncertainty.

UNIT-II

Demand Analysis: Elasticity of demand, types and significance of Elasticity of Demand - Measurement of price Elasticity of Demand – Need for Demand forecasting, forecasting techniques, Law of Supply, Elasticity of Supply.

UNIT-III

Production Analysis: Production function, Marginal Rate of Technical Substitution, Production function with one/two variables, Cobb-Douglas Production Function, Returns to Scale and Laws of returns.

UNIT-IV

Cost theory and estimation: Cost concepts, determinants of cost, cost – output relationship in the short run and long run – Modern development in cost theory – Saucer shaped short – run Average cost curves – Average total cost curve – Cost - Volume – Profit analysis

UNIT-V

Market Structure and Pricing practices: Features and Types of different Markets – Price- Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly both in the long run and short run. Pricing methods in practice – Bain's limit pricing theory - Managerial Theories of a firm – Marris & Williams Models.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Paul, Koushil: "**Managerial Economics**", Cengage Learning, New Delhi,
2. Siddiqui S A,Siddiqui A S: "**Managerial Economics**", and Financial Analysis", New Age International Publishers, New Delhi, 2008.
3. Vanita Agarwal: "**Managerial Economics**", Pearson, New Delhi, 2013.
4. Dominick Salvatore: "**Managerial Economics**", Oxford University Press, New Delhi,2010.
5. D.L. Ahuja: "**Managerial Economics**", S. Chand & Company ltd,New Delhi-55.
6. O'Sullivan, Sheffrin, Perez "Micro Economics: Principles, Applications and Tools", Pearson Education.
7. Mithani D M: "**'Managerial Economics**", Himalaya Publishing House, Mumbai, 2008.
8. Dwivedi D N: "**'Managerial Economics**", Vikas Publishing House Private Limited, New Delhi, 2009.
9. S.B. Srivastava: "**Engineering and Managerial Economics**", SCITECH Publication, New Delhi.
10. Atmanand: "**Managerial Economics**", Excel Publications. New Delhi, 2012.
11. Varshney, R.L and Maheswari, K L: "**'Managerial Economics**", Sultan Chand and Sons, New Delhi, 2002.
12. Narayanan Nadar E, Vijayan S: "**'Managerial Economics**", PHI Private Limited, New Delhi,2009.
13. Hirscgey: "**Managerial Economics**", Cengage Learning, New Delhi, 2013.
14. P.N.Chopra: "**Managerial Economics**", Kalyani Publications, New Delhi, 2011

I – I	L	P	Credits
	4	-	3

ACCOUNTING FOR MANAGERS

UNIT-I

(a) Accenting process: Definition of accounting. Accounting Cycle. Classification of accounts, accounting equation – static and dynamic nature of accounting. Users of accounting information. Books of original entry, ledger, trial balance, Terminal accounts. Accounting Concepts and conventions and their implications on the data generation.

(b) Measuring Business income: Distinction between capital and revenue: Matching revenue and Expenditure; The role of accounting policies like Depreciation and inventory valuation on reported income and related accounting standards (AS).

UNIT-II

Understanding Terminal accounts: a) preparation and presentation of income statement; Balance Sheet

b) Accounting standards–their rationale and growing importance in global accounting environment, IAS-IFRS-US GAAP; Human resource accounting concept and importance – Valuation of human resources. Preparation and presentation of final accounts of companies. Guidelines for disclosure.

C) Taxation and tax planning; corporate tax rates and tax structure;

UNIT-III

Financial Analysis: The scope and purpose of financial analysis; financial statement analysis. a)Ratio analysis – liquidity, activity, structural, coverage and profitability ratios; predictive power of ratio analysis; Inflation and financial analysis; applications of financial analysis; Related AS.

b) Funds flow analysis; concepts of funds; ascertaining funds from operations ; Sources of funds: Uses of funds; Preparation and analysis of funds flow statement and cash flow statement. Related AS.

UNIT-IV

Cost accounting concepts; role of cost accounting information in planning and control; interfaces of cost accounting; financial accounting and

managerial accounting; Cost concepts. Determination of product cost. Preparation of cost sheet under different cost heads

UNIT-V

Cost behavior and Decision making; methods for determining fixed and variable costs; CVP analysis and decision making break even analysis- key factor distribution & analysis; Optimization of product mix, make or buy decisions.

Capacity utilization, plant shutdown, CVP under conditions of uncertainty-sensitivity analysis, Standard costing, Definition of Standard Costing, Purpose of standards, Types of standards, standard setting. Zero based budgeting: concept , importance and relevance.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES:

1. Vijaya Kumar.P, Ravindra P.S., Kiran Kumar V: "**Accounting for Managers**", Himalaya Publishing House, New Delhi, 2013
2. Shankarnarayana, Ramanath: "**Finanacial Accounting for Management**", Cengage Learning, New Delhi.
3. Ramachandran N, RamKumar Kakani: **Financial Accounting for Management**", McGraw Hill – 2013.
4. Maheshwari, Maheashwari and Maheshwari, "**Financial Accounting**", Vikas publishing House, New Delhi,2013
5. Amberish Gupta:"**Financial Accounting for Management**", Pearson Education, 2012.
6. Paresh Shah: "**Financial accounting for management**", Oxford University press, New Delhi, 2013.
7. Dr. Jawahar Lal: "**Accounting for management**", Himalaya Publishing house, NewDelhi, 2012.
8. Asish K. Bhattacharyya: "**Essentials of Financial Accounting**", PHI Learning, New Delhi, 2012.
9. Dr. V.R.Palanivelu: "**Accounting for Management**". University Science Press, New Delhi, 2009.
10. Ashok Banerjee: "**Financial Accounting**", a managerial Emphasis, Excel books, New Delhi, 2012.

I – I	L	P	Credits
	4	-	3

MANAGERIAL COMMUNICATION

UNIT-I

Role of Communication in Business – Objective of Communication – The Process of Human Communication – Media of Communication, Written Communication - Oral Communication - Visual Communication, Audio Visual Communication – Silence-Developing Listening Skills – Improving Non-verbal communication skills – Cross Cultural Communication – problems and challenges.

UNIT-II

Managing Organization Communication – formal and Informal Communication - Intrapersonal Communication – Models for Inter Personal Communication - Exchange Theory.

UNIT-III

Managing Motivation to Influence Interpersonal Communication- Inter-Personal communication – Role of Emotion in Inter Personal Communication – Communication Styles – Barriers to Communication – Gateways to Effective Interpersonal Communication.

UNIT-IV

Business Writing Skills- Significance of Business Correspondence, Essentials of Effective Business Correspondence, Business Letter and Forms, Meeting, Telephone Communication – Use of Technology in Business Communication. Report Writing – Meaning and Significance: Structure of Reports - Negative, Persuasive and Special Reporting: Informal Report – Proposals. Formal Reports.

UNIT-V

Presentation skills – techniques of presentation – types of presentation – video

Conferencing and formats – interview – formal and informal – interview techniques

– Communication etiquettes.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES:

1. Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.
2. Kuberudu B and Srinivasa Krishna K: "***Business Communication and Soft Skills***", Excel Books, 2008.
3. Meenakshi Rama: "***Business Communication***", Oxford University Press, New Delhi
4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai
5. Paul Turner: "***Organisational Communication***", JAICO Publishing House, New Delhi.
6. SathyaSwaroopDebasish, Bhagaban Das" "***Business Communication***", PHI Private Limited, New Delhi, 2009.
7. R.K.Madhukar: "**Business Communication**", Vikas Publishing House, New Delhi, 2012.
8. Kelly M Quintanilla, Shawn T.Wahl:"**Business and Professional Communication**", SAGE, New Delhi, 2012.
9. Sangita Mehta, NeetyKaushish: "**Business Communication**", University Science Press, New Delhi, 2010.
10. Anjali Ghanekar: "**Business Communication Skills**", Everest Publishing House, New Delhi, 202011

I – I	L	P	Credits
	4	-	3
BUSINESS ENVIRONMENT			

UNIT-I

Business Environment: Importance at national and international level – problems and challenges – factors both internal and external influencing business environment. Industrial policies since independence and their significance – regulatory and promotional framework - Five-year plans and their importance.

UNIT-II

Structure of Indian economy – Nature and significance – Economic systems – structure of Indian industry – Economic reforms in various sectors – nature – challenges – social justice – Disinvestment mechanism – problems and procedures – Sickness in Indian industry, competition Act 2002.

UNIT-III

Fiscal Policy: nature and significance – public revenues – expenditure-debt, development activities allocation of funds – critical analysis of the recent fiscal policy of Government of India.Balance of Payments: Nature – structure – major components – causes for disequilibrium in balance of payments – correction measures.

UNIT-IV

India's Trade Policy: Nature – Magnitude and direction of Indian international trade – problems – bilateral and multilateral trade agreements. International business environment: Nature – significance– challenges and mechanisms. WTO: Agreements in the Uruguay round including TRIPS, TRIMS and GATS – disputes settlement mechanism – dumping and antidumping measures.

UNIT-V

Legal Frame: special features of the SICA (special provisions) 1985, BIFR, Consumer protection act 1986, Environmental laws (pertaining to the control

and prevention of Air and Water pollution) and the Essential Commodities Act 1955.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES:

1. Shaikh Saleem: "**Business Environment**", Pearsons, New Delhi,
2. Veena Keshav Pailwar: "**Economic Environment of Business**", PHI Learning, New Delhi, 2012
3. Rosy Joshi, Sangam Kapoor: "**Business Environment**", Kalyani Publishers, New Delhi, 2011.
4. Aswathappa K: "**Essentials of Business Environment**", Himalaya Publishing House, New Delhi, 2011.
5. Vivek Mittal: "**Business Environment Text and Cases**", Excel Books New Delhi, 2011.
6. Sundaram and Black: "***International Business Environment Text and Cases***", PHI Private Limited, New Delhi.
7. Avid W Conklin: "***Cases in Environment of Business***", Sage Publication India Private Ltd, New Delhi.
8. Raj Kumar: "**International Business Environment**", Excel Publication, New Delhi, 2012.
9. Palle Krishna Rao: "***WTO-Text and Cases***", Excel Publication, New Delhi.
10. Government of India, ***Latest Economic Survey Report***.

I – I	L	P	Credits
	4	-	3

QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS

UNIT-I

Basic Mathematical & Statistical Techniques**:** Linear, Quadratic, Logarithmic and Exponential Functions- Permutations and Combinations – Matrices - Elementary operations of matrices. Measures of Central Tendency – Measures of Dispersion –Simple Correlation and
Regression Analysis
Concept of Probability- Probability Rules – Joint and Marginal Probability – Baye's
Theorem- Probability Distributions- Binomial, Poisson, Normal and Exponential Probability
Distributions.

UNIT-II

Introduction to Decision Theory: Steps involved in Decision Making, different environments in which decisions are made, Criteria for Decision Making, Decision making under uncertainty, Decision making under conditions of Risk-Utility as a decision criterion, Decision trees, Graphic displays of the decision making process, Decision making with an active opponent.

UNIT-III

Linear Programming: Formation of mathematical modeling, Graphical method, the Simplex Method; Justification, interpretation of Significance of All Elements In the Simplex Tableau, Artificial variable techniques: Big M method, Two phase method.

UNIT-IV

Transportation, Assignment Models & Game theory: Definition and application of the transportation model, solution of the transportation problem, the Assignment Model, Traveling Salesman Problem. Game Theory: Introduction – Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, matrix and arithmetic methods.

UNIT-V

P.E.R.T. & C.P.M. and Replacement Model: Drawing networks – identifying critical path – probability of completing the project within given time- project crashing – optimum cost and optimum duration. Replacement models comprising single replacement and group replacement

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. N.D.Vohra: "***Quantitative Techniques in Management***", Tata-McGraw Hill Private Limited, New Delhi, 2011.
2. J. K. Sharma, "***Operations Research: Theory and Applications***", Macmillan Gupta S.P: "***Statistical Methods***", S. Chand and Sons, New Delhi,
3. Anand Sharma: "**Quantitative Techniques for Business decision Making**", Himalaya Publishers, New Delhi,2012;
4. D P Apte: "***Operation Research and Quantitative Techniques***", Excel Publication, New Delhi, 2013
5. Hamdy, A.Taha: "***Operations Research: An Introduction***", Prentice-Hall of India, New Delhi 2003.
6. Anderson: "**Quantitative Methods for Business**", Cengage Learning, New Delhi 2013
7. Sancheti, Dc & VK Kapoor, "**Business Mathematics**", S Chand and Sons, New Delhi
8. R.B.Khanna: "**Quantitative Techniques for Managerial Decision**", PHI Learning, New Delhi, 2012.
9. Keller, G, "**Statistics for Management**", 2009, 1st Ed, Cengage Learning.
10. Amir D. Aczel and Jayavel Sounderpandian, "**Complete Business Statistics**", TMH,
11. C.R.Kothari: "**Quantitative Techniques**", Vikas Publishing House, New Delhi, 2010
12. L.C.Jhamb: "**Cases and Problems in Quantitative Techniques**", Everest Publishing House, New Delhi,

I – I	L	P	Credits
	-	6	3
INFORMATION TECHNOLOGY LAB (100% LAB)			

UNIT-I

Introduction of various software used for business and their significance in the current business environments. Introduction of software MS Office, SQL.

UNIT-II

Financial modeling like present value of cash flows, valuations, financial ratio analysis, forecasting, trend analysis of data, random input generations

UNIT-III

Statistics for management - correlation and regression analysis data presentation techniques. Spread sheet showing the monthly payments with changing interest rate over a period of loan. (Using excel)

UNIT-IV

Data Collection and analyzing techniques - chats, flow diagrams TQM methodologies

UNIT-V

Preparation and presentations of mini projects assigned for course work of first semester.

REFERENCES:

1. Shelly, Cashman: "Microsoft copies 2007", Cengage Learning, New Delhi. 2012

I – II	L	P	Credits
	4	-	3

FINANCIAL MANAGEMENT

UNIT -I

The Finance function: Nature and Scope. Evolution of finance function – The new role in the contemporary scenario - Goals of finance function – Firm's mission and objectives. maximizing vs. satisfying (School); Profit vs. Wealth Vs. Welfare: the agency relationship and costs – The new debate on maximizing – vs.- satisfying. Major decision of financial manager. Risk-return trade off.

UNIT-II

Financing Decision: Sources of finance - a brief survey of financial instruments. Concept and financial effects of leverage. The capital structure decision in practice: EBIT – EPS analysis. Cost of Capital: The concept – Average vs. Marginal Cost of Capital. Measurement of Cost of Capital – Component Costs and weighted Average Cost.

UNIT -III

(a) The Investment Decision: Investment decision process- Concept of time value of money. Techniques of time value of money. Developing Cash Flow Data. Using Evaluation Techniques-Traditional and DCF methods. The NPV vs. IRR Debate. Approaches for reconciliation. Capital budgeting decision under conditions of risk and uncertainty: Measurement of Risk – Risk adjusted Discount Rate, Certainty Equivalents and Beta coefficients, Probability tree approach – Sensitivity analysis (a brief discussion of concepts and their numerical applications only).

(b) Dividend Decision: Major forms of dividends- Cash and Bonus shares. The theoretical backdrop-Dividends and valuation: Major theories centered on the works of Gordon walter and Lintner – Dividend policies of Indian Corporate.

UNIT-IV

Working Capital Management: Concepts and characteristics of working capital. Factors determining the working capital. Estimating working capital

requirements. Working capital policy. Management of current assets – Cash, Receivables and Inventory.

UNIT-V

Mergers and acquisitions: Merger vs. acquisition, types of mergers, mergers and acquisition trends in India. Tender offer and hostile takeover. Leveraged buy-outs. Financial management in Government companies: Scope of finance function in PSU. Social responsibility of PSUs, Performance and zero base budgeting in PSUs.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES:

1. P.Vijaya Kumar, P.S.Ravindra, V. Kirankumar "**Financial Management",** Himalaya Publishing House, New Delhi,2013.
2. Rajiv Srivastava, Anil Misra: "**Financial Management**", Oxford University Press, New Delhi,2012
3. Brigham,E.F: "**Financial Management Theory and Practice**", Cengae Learning, New Delhi, 2013
4. Prasanna Chandra: "**Financial Management Theory and Practice**", Tata McGrawHill 2011.
5. I.M. Pandey: "**Financial Management",** Vikas Publishers, New Delhi, 2013.
6. RM Srivastava, Financial Management, Himalaya Publishing house, 4th edition.
7. Khan and Jain: Financial Management, Tata McGraw Hill, New Delhi,
8. Pradip Kumar Sinha: "**Financial Management**", Excel Books, New Delhi, 2009.
9. A.P.Rao: "**Fundamentals of Financial Management**". Everest Publishing House, New Delhi.
10. Vyuptakesh Sharan: "**Fundamentals Financial Management**", Pearson, New Delhi, 2012.
11. Shashi K.Gupta: "**Financial Services**", Kalyani Publishers, New Delhi, 2012.

I – II	L	P	Credits
	4	-	3

HUMAN RESOURCE MANAGEMENT

UNIT-I

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department –aligning HR strategy with organisational strategy - HRM at global perspective- challenges – cross-cultural problems – emerging trends in HRM.

UNIT –II

Investment perspectives of HRM: HR Planning –demand and supply forecasting - Recruitment and Selection- sources of recruitment - Tests and Interview Techniques - Training and Development – methods and techniques– training evaluation - retention - Job Analysis – job description and specifications. Management development - HRD concepts – mechanisms – career planning and counseling.

UNIT-III

Performance Evaluation: importance – methods – traditional and modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments - compensation mechanisms at international level.

UNIT-IV

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- - Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms

UNIT-V

Managing Industrial Relations- Trade Unions-Employee Participation

Schemes-Collective Bargaining–Grievances and disputes resolution mechanisms. –Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress. HR accounting and auditing: Nature and significance –problems – HR audit - process – HRIS - methods.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. K Aswathappa: "***Human Resource and Personnel Management***", Tata McGraw Hill, New Delhi, 2013
2. N.Sambasiva Rao and Dr. Nirmal Kumar: "**Human Resource Management and Industrial Relations**", Himalaya Publishing House, Mumbai
3. Mathis, Jackson,Tripathy:"***Human Resource Management: Asouth-Asin Perspective***", Cengage Learning, New Delhi, 2013
4. Subba Rao P: "***Personnel and Human Resource Management-Text and Cases***", Himalaya Publications, Mumbai, 2013.
5. Madhurima Lall, Sakina Qasim Zasidi: "**Human Resource Management**", Excel Books, New Delhi, 2010
6. Muller_Camen. Croucher and Leigh: "***Human Resource Management- A Case Study Approach***", JAICO Publishing, Delhi.
7. S.Seetharaman, B.Venkateswara Prased: "***Human Resource Management***", SCITECH Publication (India) Limited, Hyderabad, 2009.
8. Gary Dessler, BijuVrkkey: "***Human Resource Management***", Pearson Education, New Delhi, 2011
9. Uday Kumar Haldar: "***Human Resource Development***", Oxford University Press,New Delhi, 2012.
10. Narendar Singh:"***Human Resource Management***", Universities Press (India) Private Limited, Hyderabad, 2011.
11. B.B.Mahapatro:"***Human Resource Management***", New Age International Publishers, New Delhi, 2011
12. R.S.Dwivedi: "***Human Relations and Organisational Behaviour",*** MacMillan Business Books, New Delhi, 2013.

I – II	L	P	Credits
	4	-	3

MARKETING MANAGEMENT

UNIT-I

Introduction to Marketing: Needs, Wants, Demands, Products, Exchange, Transactions, Market, Marketing, Production Concept, Product Concept, Sales Concept, Marketing Concept, Societal Marketing Concept, Indian Marketing Environment. Marketing Intelligence system, marketing decision system

UNIT-II

Market Segmentation and Targeting: Identification of Market Segments, - Consumer and Institutional/corporate Clientele - Segmenting Consumer Markets, Segmentation Basis, Selecting Target Markets, Segmentation and Targeting as a Basis for Strategy Formulation. Developing and Communicating a Positioning Strategy.

UNIT-III

Pricing Strategy: Objectives of Pricing, Methods of Pricing, Selecting the final price, Adopting price, initiating the price cuts, imitating price increases, Responding to Competitor's price changes.

UNIT-IV

Marketing Communication: the communication process , Communication mix, Managing advertising sales promotion , Public relations and Direct Marketing. Sales force Objectives, Sales force structure and size, Sales force Compensation.

UNIT-V

Marketing Organization and Control: Evolution of Marketing Department, Organizing the Marketing Department, Marketing Implementation, Control of Marketing Performance, Annual Plan Control, Profitability Control, Efficiency Control, Strategic Control.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Lamb, Hair, Sharma: "**MKTG**" Cengage Learning , New Delhi, 2013
2. Phillip Kotler: "**Marketing Management** ", Pearson Publishers, New Delhi, 2013.
3. Rajan Sexena: "**Marketing Management**", Tata McGraw Hill, New Delhi, 2012.
4. R.Srinivasan: "**Case Studies in Marketing**", PHI Learning, New Delhi, 2012
5. Tapan K Pand: "**Marketing Management**", Excel Books, New Delhi, 2012
6. Paul Baines, Chris Fill, Kelly Page Adapted by Sinha K: "**Marketing**", Oxford University Press, Chenni, 2013.
7. Arun Kumar, Meenakshi N: "**Marketing Management**", Vikas Publishing House, New Delhi, 2012.
8. Sontakki C.N.: "**Marketing Management**". Kalyani Publishers, New Delhi, 2012..
9. Kenneth E, Clow, Donald Baack: "**Cases in Marketing**", SAGE ,New Delhi, 2012.
10. Dilip M, Sarwate: "**Indian Cases in Marketing Management**", Everest Publishing House, New Delhi,

I – II	L	P	Credits
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PRODUCTION & OPERATIONS MANAGEMENT

UNIT-I

Introduction: Overview & Definition of production and operations management. Nature and Scope of Production and Operations Management- Historical Evolution –Role & responsibilities of the production manager. Types of manufacturing processes and Product Design.

UNIT-II

Production Planning and Control: Stages in PPC – Gantt – PPC in Mass, Batch, and Job Order Manufacturing- Aggregate planning and Master Scheduling, MRP, CRP. Maintenance management & Industrial Safety. Plant Location & Layout Planning- Factors influencing location - types of layouts. Capacity Planning – Optimal Production Strategies: Scheduling and Sequencing of Operations. Work Design: Method Study and Work Measurement - Work Sampling.

UNIT-III

Managing of Work Environment –Automation —Technology Management - Waste Management. Quality Assurance and Quality Circles – Statistical Quality Control –Control Charts for Variables- Average, Range and Control charts for Attributes. Acceptance Sampling Plans. Purchase functions and Procedure - Inventory control – Types of Inventory– Safety stock – Inventory Control Systems –JIT, VMI.

UNIT-IV

Basic concepts of quality, dimensions of quality, Juran's quality trilogy, Deming's 14 principles, Quality improvement and cost reduction, ISO 9000-2000 clauses & coverage. Six Sigma, Productivity –factors affecting productivity, measurement & improvements in productivity - new product development and design - stages & techniques. Total Productive Maintenance (TPM).

UNIT-V

Stores Management: Objectives of Stores Management – Requirements for efficient. Management of Stores – safety stock Inventory Control - Different Systems of Inventory Control, Costs & Types of Inventory. – ABC, VED and FNSD analyses. Value Analysis– importance in cost reduction – concepts and procedures.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Panner Selvem: "**Production and Operation Management**", Prentice Hall of India, NewDelhi, 2012.
2. K.Aswathappa, K. Shridhara: "**Production & Operation Management**", Himalaya Publishing House, New Delhi, 2012
3. Ajay K Garg: "**Production and Operation Management**", TMH, New Delhi,2012
4. Deepak Kumar Battacharya: "**Production & Operation Management**", University Press, New Delhi, 2012
5. AlanMuhlemann, JohnOakland,jasti Katyayani: "**Production and Operation Management**", Pearson, New Delhi,2013
6. Gagan Deep & Mandeep : "**Production and operations Management**", Kalyani publishers, New Delhi, 2010
7. Upendra Kachru: "**Production and Operations Management**", Excel Books, New Delhi, 2013.
8. L.C. Jhamb: "**Production and Operations Management**", Everest Publishing House, New Delhi, 2013.
9. Kaushal: "**Case Studies solutions in Production and Operations Management**", MacMillan, New Delhi, 2012.
10. P.Ram Murthy: "**Production and Operations Management**", New Age International Publishers, New Delhi, 2009.

I – II	L	P	Credits
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BUSINESS RESEARCH METHODS

UNIT-I

Introduction : Nature and Importance of research, The role of business research, aims of social research, research process, pure research vs. applied research, qualitative research vs quantitative research, exploratory research, descriptive research and experimental research, ethical issues in business research. Research Process – Types of Research –Defining Research Problem – Formulation of Hypothesis – Testing of Hypothesis.

UNIT-II

Data Base: Discussion on primary data and secondary data, tools and techniques of collecting data. Methods of collecting data. Sampling design and sampling procedures. Random Vs. Non-random sampling techniques, determination of sample size and an appropriate sampling design. Designing of Questionnaire –Measurement and Scaling – Nominal Scale – Ordinal Scale – Interval Scale – Ratio Scale – Guttman Scale – Likert Scale – Schematic Differential Scale.

UNIT-III

Survey Research and data analysis: media used to communicate with respondents, personal interviews, telephone interviews, self-administered questionnaires, selection of an appropriate survey research design, the nature of field work, principles of good interviews and field work management. Editing – Coding – Classification of Data – Tables and Graphic Presentation –Preparation and Presentation of Research Report.

UNIT-IV

Statistical Inference & quality control: Tests of Hypothesis, Introduction to Null hypothesis vs alternative hypothesis, parametric vs. non-parametric tests, procedure for testing of hypothesis, tests of significance for small samples, application, t-test, Chi Square test. Statistical Quality Control Upper quality charts p charts LCL UCL, BAR CHARTS. Attribute charts and industrial applications.

UNIT -V

Multivariate Analysis: Nature of multivariate analysis, classifying multivariate techniques, analysis of dependence, analysis of interdependence. Bivariate analysis-tests of differences-t test for comparing two means and z-test for comparing two proportions and ANOVA for complex experimental designs.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Navdeep and Guptha : "**Statistical Techniques & Research Methodology**", Kalyani Publishers
2. Willam G.Zikmund, Adhkari: "***Business Research Methods***", Cengage Learning, New Delhi, 2013.
3. S.Shajahan: "***Research Methods for management***", JAICO Publishing House, New Delhi, 2009.
4. UWE FLICK: "**Introducing *Research Methodology***", SAGE, New Delhi,2012.
5. Cooper R.Donald and Schindler S. Pamela: "***Business Research Methods***", 9/e, Tata MCGraw Hill, New Delhi.
6. M.V.Kulkarni: "**Research Methodology**" , Everest Publishing House, New Delhi, 2010.
7. Sachdeva: "***Business Research Methods***", Himalaya Publishing House, Mumbai, 2011
8. Ranjit Kumar: "**Research Methodology",** Pearson,New Delhi,2012
9. Deepak Chawla , Neena Sondhi: "**Research Methodology, Concepts and Cases**" Vikas Publishing House, New Delhi, 2011.
10. Alan Bryman, Emma Bell: "**Business Research Methods**", Oxford University Press, New Delhi, 2011.

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BUSINESS ETHICS AND CORPORATE GOVERNANCE

UNIT-I

Importance of Business Ethics: Values and Ethics- Business Ethics and Law – Ethics in Work Place – Ethical Decision Making- Theories of Business Ethics – Management and Ethics- Indian Ethical Traditions

UNIT-II

Impact of Globalization on Indian business ethics. Reasons for Unethical Practices among Indian companies – Development of Indian Capital Markets – Various studies on Ethical Attitudes of Managers Major Indian Scams

UNIT-III

Ethics in Marketing, HRM and Finance: Product safety and Pricing-Ethical responsibility in Product- Advertising and Target Marketing Ethics of sales, advertising and product placement and Consumer Autonomy.Ethics in HRM & Finance – HR related ethical issues - Institutional Culture – Frauds in Banks - Measures against Bank Frauds – Frauds in Insurance sector

UNIT-IV

Corporate Governance: An overview – Theory and Practice of Governance-Indian model of Governance- Good Corporate Governance – Land marks in emergence of Governance OECB Principles – Sarbanes-Oxley Act 2002-SEBI Initiatives

UNIT-V

Corporate Governance Indian Scenario: Role of Government in Ensuring Corporate Governance – Governance issues relating to Board of Directors – Duties and responsibilities of Auditors – Governance under limited competition – Role of Media – Corporate Governance in Developing and Transiting Economies.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES:

1. S.K.Mandal: "**Ethics in Business and Corporate Governance**", TMH, New Delhi, 2012.
2. Marianne M Jennings: "**Cases in Business Ethics**", Cengage Learning, New Delhi, 2012.
3. S.Prabhakaran: "**Business Ethics and Corporate Governance**", Excel Books, New Delhi, 2011.
4. N.Balasubramanyam: "**A Case Book on Corporate Governance and Stewardship**", TMH., New Delhi, 2011.
5. A.C.Fernando: "**Business Ethics and Corporate Governance**", Pearson Publishers, New Delhi, 2013.
6. H.C.Mruthyunjaya: "**Business Ethics and Value Systems**", PHI Learning, New Delhi, 2013.
7. U.C Mathur: "**Corporate Governance Business Ethics; Text and Cases**", MacMillon, New Delhi, 2012.
8. Bob Tricker: "**Corporate Governance**", Oxford University Press, New Delhi, 2010.
9. Sisir Mazumder: "**Values and Ethics in Profession**", Everest Publishing House, New Delhi, 2013.

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STRATEGIC MANAGEMENT			

UNIT-I

Introduction: Concepts in Strategic Management, Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Crafting a strategy - Industry and Competitive Analysis

UNIT-II

Environmental Scanning and leadership: Methods. SWOT Analysis – Strategies and competitive advantages in diversified companies and its evaluation. Strategic Analysis and Choice: Tools and techniques- Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

UNIT-III

Strategy Formulation : Strategy Framework For Analyzing Competition, Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

UNIT-IV

Strategy Implementation : Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

UNIT-V

Strategy Evaluation and control – Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Strategic surveillance -strategic audit

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Vijaya Kumar P,. Hitt A : **Strategic Management**, Cengage learning, New Delhi,2010

2. John A PearceII, Amita Mital: "**Strategic Management**", TMH, New Delhi, 2012.

3. Sanjay Mohapatra: "**Cases Studies in Strategic Management**", Pearson, New Delhi,2012

4. Adrian Haberberg&Alison: **Strategic Management**, Oxford University Press, New Delhi, 2010

5. P.Subba Rao: "**Business Policy and Strategic Management**" Text and Cases, Himalaya Publishing House, New Delhi, 2011

6. Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: "**Strategic Management and Business Policy"**, Excel Books, New Delhi, 2012

7 Edward Freeman R: "**Strategic Management**", Cambridge University Press,New Delhi, 2011.

8. U.C.Mathur: "**Strategic Management**", MacMillan Pulishers, New Delhi, 2010

9. R.Srinivasan: **Strategic Management**, PHI Learning, New Delhi, 2012

10. Nag A: "**Strategic Management**", Vikas Publishing House, New Delhi, 2011.

11. S.K.Sarangi:"**Modern Strategic Management**", Everest Publishing House,New Delhi, 2010.

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LEGAL ASPECTS OF BUSINESS

UNIT-I

Importance of Commercial Law: The Indian Contracts Act, 1872 – Nature of the Act and Classification of Contracts – Essentials of a Valid Contract – Offer and Acceptance – Capacity – Consideration –Free Consent –Legality of Object –Performance of a Contract – Discharge of a Contract – Breach of a Contract and Remedies.

UNIT-II

Sales of Goods Act: Distinction between Sales and Agreement to Sell – Conditions and Warranties – Performance of Contract of Sale –Transfer of Ownership – Rights of an Unpaid Seller. Consumer Protection Act, 1986: Consumer Right –Machinery for Redressal of Consumer Grievances.- Information Technology Act 2000.

UNIT-III

Contract of Agency**:** Kinds of Agents –Creation of Agency- Duties and Rights of Principal and Agents- Principal's Liability for the Acts of the Agent-Liability of Agent –Termination of Agency. Negotiable Instruments Act, 1881- Kinds of a Negotiable Instruments and endorsement- Presentation and discharge of Negotiable Instrument.

UNIT-IV

Indian Partnership Act, 1932: Meaning and Essentials of Partnership-Registration – Tests of Partnership-Duties and Rights of Partners – Dissolution of Partnership.

UNIT-V

Company Act 1956-Nature and Types of Companies – Formation – Memorandum of Association-Articles of Association –Kinds of Shares – Duties of Directors-Winding up.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Ravindra Kumar: "**Legal Aspects of Business**", Cengage Learning, New Delhi, 2011
2. Kuchhal M C, Deepa Prakash: "**Business Legislation for Management**", Vikas Publishing House, New Delhi, 2012
3. Pathak: "**Legal Aspects of Business**", Tata McGraw Hill, New Delhi, 2010
4. S.N.Maheshwari, S.K.Maheshwari: "**A Manual of Business Laws**", Himalaya Publishing House, 2013.
5. P.K.Padhi: "**Legal Aspects of Business**", PHI Learnings, New Delhi, 2013
6. S.S Gulshan: "**Business Law**", Excel Books, New Delhi, 2012
7. Daniel Albuquerque: "**Legal Aspects of Business**", Oxford University Press, New Delhi, 2013
8. S.S.Gulshan, G.K.Kapoor: "**Business Law Including Company Law**", New-Age Publishers, New Delhi, 2011
9. Tejpal Sheth: "**Business Law**", Pearson, New Delhi, 2012.
10. N.M.Vechalekar: "**Business Law**", Everest Publishing House, New Delhi, 2011.

I – III	L	P	Credits
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RETAIL MANAGEMENT			

UNIT-V

Basic concept of retailing – retail development – types and functions of retailers – multi channel retailing – organized retailing in India – special characteristics of retailing
services retailing- legislation for retailing in India.

UNIT -II

Retail strategy: market strategy – retail format and target market – building sustainable competitive advantage – growth strategies – strategic retail planning process.

UNIT-III

Retail location – types, location opportunities – selection of location and Site analysis - financial strategy – strategic profit model – setting and measuring performance objectives.

UNIT-IV

Store layout and design, store operations and inventory management-merchandise planning and control, buying merchandise – developing assortment plan.

UNIT -V

Retail pricing strategy, category management, customer services – retail branding- International retailing – promotional strategies – advertising, sales promotion, store atmosphere.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Sheikh and Kaneez Fatima, "**Retail Management**", Himalaya Publishing House, Mumbai, 2012
2. A.J. Lamba:"**The Art of Retailing**", Tata McGraw Hill Education Pvt. Ltd. New Delhi.2011
3. Sivakumar, A, "**Retail Marketing**", Excel Books, New Delhi, 2007
4. Swapna Pradhan, "**Retail management**", Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2012
5. Berman Barry, Joel R. Evans and Mini Mathur, "**Retail Management-A Strategic Approach**", Pearson Education, New Delhi, 2011.
6. Chetan Bajaj RajnishTuli, Nidhivarma Srivastava:"R**etail Management**", Oxford University Press, New Delhi, 2012.
7. Gibson G Vedamani, "**Retail Management**", Jaico Publishing House, New Delhi.
8. Dunne: "**Introduction to Retailing**", Cengage Learning, New Delhi, 2013

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	4	-	3

(HRM-ELECTIVE-I)
COMPENSATION AND PERFORMANCE MANAGEMENT

UNIT-I

Compensation: concept and definition – objectives and dimensions of compensation program – factors influencing compensation – aligning compensation strategy with business strategy – concept of reward - non-financial compensation system - Managing Compensation: Designing a compensation system – internal and external equity– pay determinants - frame work of compensation policy - influence of pay on employee attitude and behavior - the new trends in compensation management at national and international level.

UNIT-II

Wage concepts and theories: minimum wages, fair wages, living wages – money and real wages – wage theories – wage incentives - classification of incentives, incentive systems, wage incentives in India, recommendations of the National Commission on Labor – fringe benefits - wage differentials – linking wage with productivity. Executive compensation – trends – welfare measures – statutory and non-statutory.

UNIT-III

Wage and Salary administration: Nature and importance – job analysis – methods - job evaluation - wage determination process – methods of wage fixation – wage structure - multi-dimensional approach – wage problems – wage surveys – wage administration –economic objectives of wage policy – legal frame work – The payment of Wages Act 1936, The Minimum Wages Act 1948 and other similar act and amendments – institutional mechanism for wage determination

UNIT-IV

Performance Management: Importance - methods- process- Definition, concepts and scope – Goal Setting- Linkages to Strategic Planning- Competency mapping- Performance Management System: objectives –

Functions- Performance Management Cycle- Competency based Performance Management Systems- Reward based Performance Management Systems- Electronic Performance Management Systems- Performance Management Tools: Importance- Traditions and Modern Techniques- Balanced Score Card- 360 Degree Performance Apprising- Merit Rating- MBO- BARS

UNIT-V

Unit 6: Appraising for Recognition & Reward: Purpose of Appraising – Methods of appraisal – appraisal system design – Implementing the appraisal system –Organizational effectiveness - Performance management skills – Building and leading High performing teams – Performance Monitoring and Counseling: Introduction- Supervision- Objectives and Principles of Monitoring- Monitoring Process- Periodic reviews- Problem solving- Role efficiency- Coaching- Counseling and Monitoring- Performance Audit.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. T.V.Rao: "**Performance Management Appraisal Systems**", Sage Publications, 2008
2. A.M.Sarma, N.Sambasiva Rao: "**Compensation and Performance management**", Himalaya Publishing House, Mumbai
3. Dewakar Goel:"**Performance Appraisal and Compensation Management**", PHI Learning, New Delhi, 2012
4. B.D.Singh: "**Performance Management Systems**" Excel Books, New Delhi,2010
5 A.S. Kholi: "**Performance Management**", Oxford University Press, New Delhi,2012
6 Prem Chadha: "**Performance Management**", Macmillan India, New Delhi, 2008.
7. Bagchi: "**Performance Management**", Cengage Learning, New Delhi, 2012.
8. Topomoy DEB: "**Compensation Management**", Excel Books, New Delhi, 2009
9. George T Milkovich, JerryM Newman, C.S.Venkatratnam: "**Compensation**", TMH, New Delhi, 2013

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	4	-	3

(HRM-ELECTIVE-II)
MANAGEMENT OF INDUSTRIAL RELATIONS

UNIT-I

Industrial Relations Management – Concept- Evaluation –Background of industrial Relations in India- Influencing factors of IR in enterprise and the consequences. Economic, Social and Political environments- Employment Structure –Social Partnership-Wider approaches to industrial relations-Labour Market.

UNIT-II

Trade Unions- introduction-Definition and objectives-growth of Trade Unions in India-trade Unions Act , 1926 and Legal framework-Union recognition-Union Problems-Employees Association-introduction ,Objective Membership, Financial Status.

UNIT-III

Quality of Work Life: Workers' Participation in Management - Worker's Participation in India, shop floor, Plant Level, Board Level- Workers' Welfare in Indian scenario- Collective bargaining concepts & Characteristics – Promoting peace.Wage and Salary administration: Nature & Significance of wage, salary administration, essentials- Minimum wage- Fair wage, Real wage, Incentives & fringe benefits. Issues and Constraints in Wage Determination in India.

UNIT-IV

Social Security: introduction and types –Social Security in India, Health and Occupational safety programs- Salient features of Workmen Compensation Act and Employees' State Insurance Act relating to social security – Workers' education objectives -Rewarding.

UNIT-V

Employee Grievances – Causes of Grievances –Conciliation, Arbitration and Adjudication procedural aspects for Settlement of Grievances –Standing

Orders- Code Discipline. Industrial Disputes: Meaning, nature and scope of industrial disputes - Cases and Consequences of Industrial Disputes – Prevention and Settlement of industrial disputes in India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. C.S Venkataratnam: "**Industrial Relations**", Oxford University Press, New Delhi, 2011
2. Sinha: "**Industrial Relations, Trade Unions and Labour Legislation**", Pearson Education, New Delhi, 2013
3. Mamoria: "**Dynamics of Industrial Relations**", Himalaya Publishing House, New Delhi, 2010
4. B.D.Singh: "**Industrial Relations**" Excel Books, New Delhi, 2010
5. Arun Monappa: "**Industrial Relations**", TMH, New Delhi. 2012
6. Prof. N.Sambasiva Rao and Dr. Nirmal Kumar: "**Human Resource Management and Industrial Relations**", Himalaya Publishing House, Mumbai
7. Ratna Sen: "**Industrial Relations**", MacMillon Publishers, New Delhi, 2011
8. S.C.Srivatava: "**Industrial Relations and Labour Laws**", Vikas Publishing House, New Delhi, 2013.
9. R.Sivarethinamohan: "**Industrial Relations and Labour Welfare**", PHI Learning, New Delhi, 2010.
10. Amandeep Kaur: "**Industrial Relations**", Kalyani Publishers, New. Delhi,2010.

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	4	-	3

(MKT-ELECTIVE-I)
PRODUCT MANAGEMENT

UNIT-I

Basic concept of Product- Product planning – Defining Market strategies for leaders, challengers, Followers. Product life Cycle and market evaluation – product differentiation and deletions. Product Portfolio Analysis

UNIT-II

New Product Development: Categories of New Product – New product Development - New Product Launch – product modification – pricing decision – customer and competitor analysis – product forecasting and financial analysis

UNIT -III

Concept of Branding: Traits of Successful Brands – Brand Positioning – Anatomy of Brand – Leveraging Brands, Brand equity, Brand extension and Brand Building. Model for Global Brand Building

UNIT -IV

Marketing Organisation: Market Testing – Launch Management – Marketing Metrics – Public policy Issues – Product liability- Environmental needs – Sale methods- Brand Repositioning - Channel Management – Customer Relationship Management

UNIT -V

Packaging: Introduction – Advantages and Importance of Packaging - Packaging design – Consumer protection. Product Piracy, Worthy Products - Personal ethics and Residual Issues - Packaging trends in India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. K.S.Chandrasekar: Product Management-Text, Applications and Cases, Himalaya Publishing House, New Delhi.
2. Donald R. Lehmann, Russell S.Winer: Product Management, TaTa McGraw-Hill, New Delhi.
3. S.A. Chunawalla: Product Management, Himalaya Publishing House, New Delhi.
4. Merle Crawford, Anthony Di Benedetto, New Product Management, TaTa McGraw-Hill, New Delhi.
5. Ramanuj Majumdar: "Product Management in India", PHI Learning, New Delhi.

I – III	L	P	Credits
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(MKT-ELECTIVE-II)
PROMOTION AND DISTRIBUTION MANAGEMENT

UNIT-I

Sales Promotion: Definition, role, types, consumer sales promotion, dealer display contests, discounts, bonus offers, retail merchandising techniques. Publicity: Public relations campaign, use of press, radio and TV, opinion building, customer service and community service.

UNIT-II

Advertising: Changing concept, role of advertising in a developing economy, a critical appraisal, types of advertisement for consumer, industrial, institutional, retail, trade and professional, advertisement in marketing mix. Pre-testing, post testing, experimental designs

UNIT-III

Organizing for Advertising: Advertising department , objectives and functions - Role of advertisement agencies, skills and service, client agency relationship.Public Relations, Publicity and corporate advertising. Publicity, power of publicity, control and dissemination of publicity, advantages and disadvantages.

UNIT-IV

Advertisement budgets: Types, determining optimal expenditure, decision models, sales response and decay, communication, Ad media: media selection, optimizing approaches, scheduling, research- Sources of themes: Adapting presentation to medium campaign, USP, brand image, positioning, purchase proposition and creative interpretation, insertions, contract.

UNIT-V

Contours of Distribution Management – Wholesaling – Retail theories and Formats – Physical Distribution Management – Transportation and Traffic Management – Warehousing and Storage.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Krishna K Havaldar, Vasant M Cavale: "**Sales and Distribution Managment**", TMH, 2011.
2. S.L.Gupta: "**Sales and Distribution Management**", Excel Books, New Delhi, 2010
3. S.A.Chunawalla: "**Advertising, Sales and Promotion Management**", Himalaya Pubishing House, New Delhi,2012
4. Richard R. Still,Edward W. Cundiff, Norman A. P. Govoni: "**Sales Management**", Pearson New Delhi, 2013
5 George E Belch, Michael A Belch, Keyoor Purani: "**Advertising and Promotion:** ***An IntegratedMarketing Communication Perspective***", TMH, New Delhi,2012
6 A.S.Gupta: "**Advertising and Sales Promotion**", Everest Publishing House, New Delhi, 2010
7 Tapan K.Panda, Sunil Sahadev: "**Sales and Distribution Management**", Oxford University Press, New Delhi, 2010
8 Pingali Venugopal: "**Sales and Distribution Management** ", SAGE Publication, New Delhi,2012

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(FIN-ELECTIVE I)
INVESTMENT MANAGEMENT

UNIT-I

Investments: Definition of investment, Investment Decision Process; Sources of investment information; Real investment vs. financial investment, Investment vs. Speculation; Factors to be considered in investment decision: Liquidity, Return, Risk, Maturity, Safety, Tax and Inflation. The concept and measurement of realized return and expected return. Ex-ante and ex-post returns. Measurement of risk-range. Risk-return trade-off. Risk premium and risk aversion. Approaches to investment analysis-Fundamental and Technical Analysis; Efficient Market Hypothesis.

UNIT-II

Fixed Income Securities - Analysis, Valuation and Management Features and types of debt instruments, Bond indenture, factors affecting bond yield. Bond yield measurement-Current yield, holding period return, YTM, AYTM and YTC. Bond valuation: Capitalization of income method, Bond-price theorems, Valuation of compulsorily/optionally convertible bonds, Valuation of deep discount bonds. Bond duration, Macaulay's duration and modified Macaulay's duration. Bond immunization, active and passive bond portfolio management strategies.

UNIT-III

Common Stocks - Analysis and Valuation: Basic Features of Common Stock, Approaches to valuation–Balance sheet model, dividend capitalization models; earnings capitalization models; Price-Earnings multiplier approach and capital asset pricing model, Free Cash flow model, relative valuation using comparables-P/E,P/BV, P/S; Security Market Indexes, their uses; computational procedure of Sensex and Nifty.

UNIT-IV

Portfolio Theory: Concept of portfolio. Portfolio return and risk. Harry Markowitz's Portfolio theory, construction of minimum risk portfolio, the single-index model. Capital market theory: Introduction of risk-free asset, Capital Market Line (CML), Security Market line (SML). Capital asset pricing model (CAPM): over-pricing and under-pricing securities. Arbitrage pricing theory (APT): The Law of one price, two factor arbitrage pricing, Equilibrium risk-return relations. A synthesis of CAPM and APT.

UNIT -V

Mutual Funds and Portfolio Evaluation: Mutual funds: genesis, features, types and schemes. NAVs, costs, loads and return of mutual funds, Problems and prospects in India, Regulation of mutual funds and investor's protection in India. Performance measures- Sharpe's reward to variability index, Treynor's reward to volatility index, Jensen's differential index, Fama's decomposition of returns.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Alexander. G.J, Sharpe. W.F and Bailey. J.V, "**Fundamentals of Investments**", PHI,
2. Reilly, Brown: "**Analysis of Investments and Management of Portfolios**", Cengage Learning, New Delhi, 2013
3. Prasanna Chandra, "**Investment Analysis and Portfolio Management**", TMH, New Delhi, 2013
4. Charles.P.Jones, "**Investments: Analysis and Management**", John Wiley &Sons, Inc. 9th Ed.
5. Francis. J.C. & Taylor, R.W., "**Theory and Problems of Investments**". Schaum's Outline Series, TMH, New Delhi,
6. Preeti Singh, "**Investment Management**", Himalaya Publishing House. New Delhi.

7. Peter L. Bernstein and Aswath Damodaran, "**Investment Management**", Wiley Frontiers in Finance.

8. Shashi and Rosy: "**Security Analysis and Portfolio Management Investment Management**", Kalyani Publishers, New Delhi 3rd edt.

9. Dhanesh Khatri, "**Investment Management and Security Analysis**;Text and Cases", Macmillan Publishers. New Delhi, 2011

10. Sudhindra Bhat, "**Security Analysis and Portfolio Management**", Excel Books.32

11. Punithavathy Pandian, "**Security Analysis and Portfolio Management**", Vikas Publishing House, New Delhi.

12. V.K.Bhalla: "**Fundamentals of Investment Management**", S.Chand, New Delhi, 2013

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(FIN-ELECTIVE-II)
BANKING AND INSURANCE

UNIT -I

Introduction to Banking: Introduction to Indian Financial System - Meaning of a Bank and Customer- Bank and customer Relationship - Role of commercial banks in Economic Development - Evolution of Banking in India – origin, nationalization, reforms and Financial Inclusion in India - Financial statements of banks with special focus on Indian banks - Financial statement analysis of banks: CAMEL Approach, Key Performance indicators- Sources of Bank Funds.

UNIT -II

Uses of Bank Funds: Features of Bank Credit - types of lending - assessment of credit worthiness of a prospective borrower - management of credit process - different types of loans and their features - Loan Pricing: The basic model, pricing fixed & floating rate loans, cost-benefit loan pricing, Customer Profitability Analysis - Non Performing Assets: - gross and net concept of NPAs, causes, implications & recovery of NPAs.

UNIT -III

Regulation and Innovations in Banking System: Regulation of Bank Capital: The need to regulate Bank Capital - Concept of Economic Model - Concept of Regulatory Capital, Basel Accords I,II and III.

Banking Innovations:-Core Banking Solution - Retail Banking - Products & Services: Nature, Scope, Future and Strategies - Plastic Money - National Electronic Funds Transfer - ATM - Mobile Phone Banking - Net Banking- Banc-assurance. Changing role of Banks as Financial Intermediaries. Customer service quality in Indian banking industry.

UNIT-IV

Introduction to Insurance: Insurance as a Risk Management Tool- Principles of Insurance - Characteristics of Insurance contract - Functions of Insurers:

Production, Underwriting, Rate Making, Managing Claims and Losses, Investment & Financing, Accounting & Record Keeping and other miscellaneous functions - Types of Insurers- Concept of Reinsurance, uses and advantages - Marketing channels: Agents & brokers –professionalism, remuneration, responsibilities, classification, criteria for appointment and capital adequacy norms for broker - an overview of IRDA.

UNIT-V

Life Insurance and General Insurance: The concept of Life Insurance - types of Life Insurance contracts - Tax treatment of Life Insurance- Life Insurance Products- Classification of Life Insurance - The Actuarial Science- Provisions of Life Insurance contracts - Special Life Insurance forms - Health and General insurance–Overview, Types, Third Party Administrators- Micro Insurance in India

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Vijayakumar P., Srinivasa Subbarao P., Himalaya Publication, New Delhi.
2. Peter.S.Rose & Sylvia. C. Hudgins: "**Bank Management & Financial Services**", Tata McGraw Hill New Delhi, 2010,
3. James S. Trieschmann, Robert E. Hoyt & David. W. Sommer B:"**Risk Management & Insurance**", Cengage Learning, New Delhi
4. Reddy K S and Rao R N: "**Banking & Insurance**", Paramount Publishing House 2013.
5. Vasant Desai: "**Banks & Institutional Management**", Himalaya Publishing House 2010.
6. R.K.Sharma, Shashi and Jagwant: "**Banking and Insurance**", , Kalyani Publishers, 16th edition.
7. Emmett J. Vaughan & Therese M. Vaughan: "**Fundamentals of Risk & Insurance**", Wiley, India Edition.

8. H. Narayanan: "**Indian Insurance – A Profile**", Jaico Publishing House, New Delhi.

9. Harold. D. Skipper & W. Jean Kwon: " **Risk Management & Insurance, Perspectives in a Global Economy**", Blackwell Publishing New Delhi.

10. S. Aruna Jatesan, T.R. Viswanathan: " **Risk Management & Insurance**", MacMillan New Delhi.

11. Mark. S.Dorfman: "**Introduction to Risk Management & Insurance**", Prentice-Hall of India Private Limited

12. NIA: "**Life Insurance Principles and Practices**", Cengage Learning, New Delhi,2013.

13. Neelam C.Gulati: "Banking and Insurance: Principles and Practice", Excel Books, New Delhi 2011.

I – III	L	P	Credits
	4	-	3
(SYS-ELECTIVE-I) **E-BUSINESS**			

UNIT-I

Introduction to e-Business**:** Transitioning to the Web – E-Business and E-Commerce overview History of Internet and World Wide Web – Web development Internet and World Wide Web Resources. A Framework for understanding E-Business.

UNIT-II

E-Business Models: Storefront Models, Auction Model, Portal Model and Dynamic-Pricing Models. B2B E-Commerce and EDI. Understanding Online Communication and Behavior. Creating the Marketing Mix – Organizational and Managerial Issues. Implementation and Control of the E-Business Plan.

UNIT-III

Building an E-Business: Design and Development and Management – E-Business Solutions - Online Monetary Transactions. e-Wallets – Digital Currency and Alternate Consumer Payment Options .Smart Cards, e-Billing developing payment standards.

UNIT-IV

Internet Marketing: Branding, Promotions, E-Business Advertising – E-Customer Relationship Management – Tracking and Analyzing data, Personalization – Contact Centers Complete e-CRM Solutions

UNIT-V

Legal and Ethical Issues: Privacy and confidentiality on the Internet Other Legal areas like Defamation IPR and Patents, Trade mark Unsolicited Commercial e-Mail (Spam) Online Contracts and User Agreements. Cyber Crime – Internet Taxation Issues

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Hanson: "E-Commerce and Internet Marketing", Cengage Learning, New Delhi, 2013
2. Harvey M. Deitel, Paul J. Deitel, Kate Steinbuhler: e-Business and e-Commerce for Managers, Pearson Publication.
3. David Whiteley: E-Commerce- Strategy technologies and Applications, Tata Mac-Graw Hill, New Delhi, 2000.
4. C.S.V.Murthy: E-Commerce–Concepts, Models & Strategies, Himalaya Publishing house, Mumbai, 2003.
5 Kamalesh K Bajaj & Debjani Nag: E-Commerce, the Cutting Edge of Business- Tata McGraw- Hill, New Delhi, 2002.
6. Bharat Bhaskar: Electronic Commerce,Tata Mc-Graw-Hill, New Delhi, 2003.
7. Schneider: "E.Commerce- Strategy, Technology and Implementation" Cengage
8. Christopher Westland J, Theodore H K Clark: "Global Electonic Commerce", Universitites Press, Hyderabad, 2006.

I – III	L	P	Credits
	4	-	3

(SYS-ELECTIVE-II)
ENTERPRISE RESOURCE PLANNING

UNIT-I

Introduction to ERP: Overview of ERP – Introduction and Evaluation – advanced ERP-SCM and CRM systems and related technologies - ERP life cycle ERP implementation Life cycle-SDLC and ERP life cycle.

UNIT-II

ERP Implementation: reasons for ERP failure . pre – implementation Tasks – Implementation methodologies – Process definition – Dealing with employee resistance Training and Education – Project management and monitoring Success and failure factors of an ERP implementation.

UNIT-III

Post ERP implementation: Change Management – post implementation review, support, maintenance and security of ERP. Different business modules of an ERP package. ERP market place and market place dynamics

UNIT-IV

ERP System Options and Selection Methods: Optimal Means of Developing an ERP,

Measurement of Project Impact, IT Selection and Project Approval, ERP proposal Evaluation, Project Evaluation Techniques, Testing.

UNIT-V

ERP present and future: Turbo charge the ERP system- EAI - ERP. Internet and WWW- Future Directions and trends in ERP - Future Directions in ERP: New Markets, New Technologies, Faster Implementation Methodologies, New Business Segments, Trends in Security.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Singla: "Enterprise Resource Planning", Cengage Learning, New Delhi, 2013

2. Alexleon: "Enterprise Resource Planning", TMH, New Delhi, 2011

3. Mahadeo Jaiswal, Ganesh Vanapalli: "Enterprise Resource Planning", MacMillon, New Delhi, 2013

4. N.Venkateswaran: "Enterprise Resource Planning", SCITECH Publiscation, NewDelhi, 2009

5. S.Kesharwani, SBodduluri, M Ashok Kumar: "Enterprise Resource Planning", Paramount Publishing House, New Delhi, 2012

I – IV	L	P	Credits
	4	-	3

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

UNIT-I

Logistics and Competitive strategy: Competitive advantage – Gaining Competitive advantage through logistics-Integrated supply chains– Competitive performance - Models in Logistics Management - Logistics to Supply Chain Management – Focus areas in Supply Chain Management.- Customer service and retention- Basic service capability Value added services

UNIT-II

Measuring logistics costs and performance: The concept of Total Cost analysis – Principles of logistics costing – Logistics and the bottom-line – Impact of Logistics on shareholder value - customer profitability analysis – direct product profitability – cost drivers and activity-based costing.

UNIT-III

Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operations –Mapping the supply chain processes – Supplier and distributor benchmarking –setting benchmarking priorities – identifying logistics performance indicators –Channel structure – Economics of distribution –channel relationships –logistics service alliances.

UNIT -IV

Sourcing, Transporting and Pricing Products: sourcing decisions and transportation in supply chain – infrastructure suppliers of transport services – transportation economics and pricing – documentation - pricing and revenue management Lack of coordination and Bullwhip Effect - Impact of lack of coordination. - CRM –Internal supply chain management - .

UNIT-V

Managing global Logistics and global Supply Chains: Logistics in a global economy – views of global logistics- global operating levels – interlinked

global economy – The global supply chains -Global supply chain business processes –Global strategy –Global purchasing – Global logistics – Channels in Global logistics –Global alliances –Issues and Challenges in Global supply chain Management

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Donald J.Bowersox and David J.Closs: "Logistical Management" The Integrated Supply Chain Process, TMH, 2011.
2. Edward J Bradi, John J Coyle: " A Logistics Approch to Supply Chain Management, Cengage Learning, New Delhi, 2012.
3. D.K.Agrawal: "Distribution and Logistics Management", MacMillan Publishers, 2011
4. Sunil Chopra and Peter Meindl: "Supply chain Management: Strategy, Planning and Operation", Pearson Education, New Delhi 2013
5. Rahul V Altekar: Supply Chain Management, PHI Learning Ltd, New Delhi, 2009
6. R.P.Mohanthy: Supply Chain Management, Biztantra, New Delhi, 2010.
7. Deepak P, Miiind M.Oka: "Supply Chain Management" Everest Publishing House, NewDelhi, 10.S K Battacharya: "Logistics Management", S.Chand New Delhi, 2013.
8. Manish Bansal, Babita Singla: "Retail and Supply Chain Management ", Kalyani Publishers, NewDelhi, 2012.

I – IV	L	P	Credits
	4	-	3
ENTREPRENEURSHIP DEVELOPMENT			

UNIT-I

Entrepreneurship: Importance and growth - Characteristics and Qualities of Entrepreneur- Role of Entrepreneurship, Ethics and Social Responsibilities. Women Entrepreneurship: Role & Importance, Problems of Women Entrepreneurs – corporate entrepreneurship – mobility of entrepreneur – entrepreneurial motivation.

UNIT-II

Training: Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit - Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees. Creativity and Entrepreneurship: Sources and Methods of Ideas Planning and Development of Programmes E-business Ventures; New Venture Management – Emerging Trends.

UNIT-III

Planning and Evaluation of Projects: Growth of Firm – Project identification and selection - Factors inducing growth- - Project Feasibility Study - Post Planning of Project-Project Planning and Control.

UNIT-IV

Small and Micro Enterprises: Importance, definitions – policies and their support to MSMEs - growth and growth strategies – sickness in small business and remedies – small entrepreneurs in international business.

UNIT-V

Institutional support to entrepreneur and MSMEs: Role of Government - Role of IDBI, NIESBUD, SISI, DIC - Financial Institutions-Commercial Banks, Entrepreneurial Development Institutes, Universities and other Educational Institutions offering Entrepreneurial Development Programme.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.

2. VSP Rao, Kuratko: "Entrepreneurship', Cengage Learning, New Delhi,

3. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012

4. B.Janakiram, M Rizwana: "Entrepreneurship Development" Excel Books, New Delhi, 2011

5. Rajeev Roy: "Entrepreneurship", Oxford University Press, New Delhi,2012

6. P.C.Shejwalkar: "Entrepreneurship Development", Everest Publishing House, New Delhi, 2011

7. Manjunatha, Amit Kumar Goudar: "Management and Entrepreneurship" University Science Press, New Delhi, 2011

8. Eric A Morse, Ronald K Mitchell: "Cases in Entrepreneurship", SAGE Publiccation, New Delhi, 2011

I – IV	L	P	Credits
	4	-	3
(HRM-ELECTIVE-III) GLOBAL HRM			

UNIT-I

Introduction- A Global HR Perspective in New Economy-Challenges of Globalization -Implications of Managing People and Leveraging Human Resource- - Conflicts - Strategic role of International HRM – Global HR Planning – Staffing policy – Training and development – performance appraisal –International Labour relations – Industrial democracy – Talent crunch – Indian MNCs and Challenges - Legal content of Global HRM.

UNIT-II

Managing International Assignments: Significance – Selection methods - Positioning Expatriate – Repatriate – factors of consideration - Strategies - International assignments for women - Problems.

UNIT -III

Cross Culture Management: Importance – Concepts and issues – theories-considerations - Problems – Skill building methods – Cross Culture Communication and Negotiation – Cross Culture Teams.

UNIT -IV

Compensation Management: Importance – Concepts- Trends - Issues – Methods – Factors of Consideration – Models – incentive methods – global compensation implications on Indian systems - Performance Management.

UNIT-V

Globalization Strategic Advantages through HRD: Measures for creating global HRD Climate – Strategic Frame Work of HRD and Challenges - Globalization and Quality of Working Life and Productivity – Challenges in Creation of New Jobs through Globalization- HR interventions in Y2K- New Corporate Culture

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES:

1. Peter Dowling: "International Human Resource Management", Cengage Leanring, 2012
2. Subba Rao P: "International Human Resource Management", Himalaya Publishing House, Hyderabad, 2011
3. NilanjanSen Gupta: "International Human Resource Management Text and cases" Excel Books, New Delhi.
4. Tony Edwards :"International Human Resource Management", Pearson Education, New Delhi, 2012
5. Aswathappa K, Sadhana Dash: "International Human Resource Management, TMH, New Delhi,
6. Charles M Vance: "Managing a Global Work Force", PHI Learning, New Delhi, 2009
7. Monir H Tayeb: "International Human Resource Management", Oxford Universities Press, Hyderabad, 2012.
8. S.C.Gupta: "International Human Resource Management Text and Cases", MacMillion,New Delhi, 2012
9. Dave Ulrich, JonYounger: "Global HR", TMH, New Delhi, 2013

I – IV	L	P	Credits
	4	-	3

(HRM-ELECTIVE-IV)
MANAGEMENT OF CHANGE& DEVELOPMENT

UNIT-I

Basics of Change Management: Meaning, nature and Types of Change – change programmes – change levers – change as transformation – change as turnaround – value based change.

UNIT-II

Mapping change: The role of diagramming in system investigation – A review of basic flow diagramming techniques –systems relationships – systems diagramming and mapping, influence charts, multiple cause diagrams- a multidisciplinary approach -Systems approach to change: systems autonomy and behavior – the intervention strategy model – cases in intervention – total project management model (TPMM). Learning organization: The relevance of a learning organization – kindling learning processes in organizations- strategies to build a learning organization

UNIT-III

Organization Development (OD): Meaning, Nature and scope of OD - Dynamics of planned change – Person-focused and role-focused OD interventions –Planning OD Strategy – OD interventions in Indian Organizations – Challenges to OD practiceners.

UNIT-IV

Negotiated change: Change in the labour-management relations in the post-liberalized India – a review of the response of collective bargaining strategy to the challenges of Globalization and the restructuring of enterprises in India - Changes in the legal frame work of collective bargaining, negotiated flexibility, productivity bargaining, improved work relations, public sector bargaining and social security.

UNIT-V

Team Building: Nature and Importance of Teams – Team Vs Groups – Types of teams – Characteristics of Virtual teams – Team building life cycle – role of managers as linking pins- team building skills – Perspectives on effectiveness of Team working - Virtual teams: High performance teams – self managing teams – Building team relationships – empowered teams – leadership on teams – Managing cross –cultural diversity in teams – Group think as a decision making process – effective decision making techniques for teams and groups – role of change consultant-– contemporary issues in managing teams.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Vijayakumar P., Ravikanth B., Ratna Madhuri, Himalaya Publication, New Delhi.
2. Cummings: "Theory of Organisation Development and Change", Cengage Learning, New Delhi, 2013.
3. Robert A Paton: Change Management, Sage Publications, New Delhi, 2011.
4. NilanjanSengupta: Managing Changing Organisations, PHI Learning, New Delhi, 2009
5. Adrian Thornhill: Managing Change, Pearson Education, New Delhi, 2012.
6. Radha R Sharma: Change Management, TMH, New Delhi, 2012
7. R.L.Nandeshwar R L, Balakrishna Jayasimha: "Change and Knowledge Management", Excel Books, New Delhi, 2011.
8. Deepak Kumar Bhattacharyya: "Organisational Change and Development", Oxford University Press, New Delhi, 2011.
9. Mark Hughes: "Managing Change", University Press, New Delhi, 2011.

I – IV	L	P	Credits
	4	-	3

(MKT-ELECTIVE-III)
SERVICES MARKETING

UNIT-I

Understanding services marketing: Introduction, services in the modern economy, Classification of services, marketing services Vs. Physical services, services as a system Creating value in a competitive market-Positioning a service in the market, value addition to the service product, planning and branding service products, new service development.

UNIT-II

Customer Relationship Marketing: Relationship Marketing, the nature of service consumption, understanding customer needs and expectations, Strategic responses to the intangibility of service performances.

UNIT-III

Services market segmentations: The process of market segmentation, selecting the appropriate customer portfolio, creating and maintaining valued relations, customer loyalty.

UNIT-IV

Pricing strategies for services: Service pricing, establishing monetary pricing objectives, foundations of pricing objectives, pricing and demand, putting service pricing strategies into practice.

UNIT-V

Service promotion: The role of marketing communication. Implication for communication strategies, setting communication objectives, marketing communication mix. Planning and managing service delivery- Creating delivery systems in price, cyberspace and time. The physical evidence of the service space. The role of intermediaries, Marketing plans for services: The marketing planning process.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Rajendra Nargundkar: Services Marketing, TMH, New Delhi 2011.
2. Christian Gronroos: Service Management and Marketing, Wiley India, New Delhi,2010
3. Ram Mohan Rao, K: "Services Marketing", Pearson Education, New Delhi, 2013.
4. GovindApte: Services Marketing, Oxford University Press, New Delhi, 2010
5. S.M. Jha: "Services Marketing", Himalaya Publishing House, 2011
6. Nimith Chowdhary: "Marketing of Services", MacMillan Publishers, New Delhi, 2009
7. John E.G.Bateson, K.Douglas Hoffman: "Services Marketing", Cengage Learning, New Delhi, 2012
8. C.Bhattacharjee: "Services Marketing", Excel Books, New Delhi, 2010

I – IV	L	P	Credits
	4	-	3

(MKT-ELECTIVE-IV)
CONSUMER BEHAVIOR

UNIT-I

Introduction to Consumer Behaviour- Understanding consumers and market segments. Evolution of consumer behaviour, consumer analysis and business strategy. Models of Buyer Behavior, Howard Model, Howard-Sheth Model, EKB Model, Webster and Wind Model and Sheth Industrial Buyer Behaviour Model.

UNIT-II

Psychological Foundations of Consumer Behavior: Consumer Motivation, Perception, Personality and Behavior, Learning and Behavior Modification, Information Processing, Memory Organization and Function, Attitude Formation and Attitude Change. Social and Cultural Environment Economic, Demographic, Cross Cultural and Socio–Cultural Influences, Social Stratification, Reference Groups and Family, Personal influence.

UNIT-III

Communication and Consumer Behaviour :– Components of communications process, designing persuasive communication and Diffusion of Innovations. Consumer Decision Processes Highand Low Involvement, Pre-purchase Processes, Post Purchase processes, Consumption and evaluation, Brand Loyalty and Repeat Purchase Bahaviour.

UNIT-IV

Consumerism: The roots of consumerism, consumer safety, consumer information, environmental concerns, consumer privacy, legislative responses to consumerism and marketer responses to consumer issues.

UNIT-V

Consumer Protection: Consumer Protection Act 1986, Central consumer protection council, state consumer protection councils, consumer disputes

redressal agencies, consumer disputes redressal forum, National Consumer Disputes redressal Commission.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Ramneek Kapoor, Nnamdi O Madichie: "Consumer Behaviour Text and Cases", TMH, New Delhi, 2012.
2. Ramanuj Majumdar: "Consumer Behavior insight from Indian Market", PHI Learning, New Delhi, 2011.
3. M.S.Raju: "Consumer Behavior Concepts, applications and Cases", Vikas Publishing House, New Delhi, 2013.
4. David L Loudon and Albert J Della Bitta, Consumer Behaviour, 4/e, TMH, New Delhi, 2002.
5. Schiffman, L.G and Kanuk L.LConsumer Behaviour, 8/e, Pearson Education, New Delhi, 2003.
6. Roger D. Black Well et al, Consumer Behaviour, 9/e Cengage, New Delhi, 2012.

I – IV	L	P	Credits
	4	-	3

(FIN.-ELECTIVE III)
INTERNATIONAL FINANCIAL MANAGEMENT

UNIT-I

International Financial System: Evolution of international financial system: Bretton woods system, floating exchange rate; currency board, sterilized and unsterilized intervention; international financial markets-Eurocurrency market, international bond market, international equity market, international money market; global financial institutions–IMF, Bank for International Settlements; international banking-euro bank. International financial instruments–euro CP, Eurobonds, foreign bonds, global bonds, euro equity, ADR, GDRs

UNIT-II

Foreign Exchange Market and International Parity Relationships**:** Participants in foreign exchange market, structure of foreign exchange market in India; quotes in spot market and forward market, triangular arbitrage; nominal effective exchange rate (NEER), real effective exchange rate (REER); currency derivatives–forwards, futures, forward rate agreement, options, swaps; Foreign Exchange Management Act ; BOP, BOP trends in India; current account deficit, capital account convertibility, Tara pore Committee Report; Parity Conditions- Purchasing Power Parity, Interest Rate Parity, International Fisher Effect, Unbiased Forward Rate Theory. International debt crises and currency crises-Asian currency crisis, Greek debt crisis.

UNIT-III

Multinational Corporate Decisions in Global Markets: Foreign direct investment (FDI) and motives, FDI theories-theory of comparative advantage, OLI paradigm of FDI in India, modes of foreign investment–licensing, management contracts, joint venture, Greenfield investment, acquisition, strategic alliance, evaluation of overseas investment proposal using APV; Financial goals of MNC, financial performance measurement, international cash management, multinational capital structure decision, cost of capital , international portfolio diversification- rationale, barriers, home country bias, project financing

UNIT-IV

Risk Management in Multinational Corporations: Types of risk-currency risk, transaction exposure, translation exposure, accounting standard for translation exposure in India, economic exposure and assessment; interest rate risk, country risk assessment–political risk, financial risk; risk management through hedging-natural hedges, hedges with currency derivatives–forward market hedge, options market hedge, money market hedge, hedging recurrent exposure through swaps, hedging contingent exposure, hedging through invoice currency.

UNIT -V

International Tax Environment: Types of tax–income tax, withholding tax, value added tax, Tobin tax; taxation methods–worldwide approach, territorial approach; tax havens, offshore financial centers, re invoicing centre; Tax treaties-Double taxation Avoidance agreement, multilateral tax treaties; foreign tax credit, tax neutrality tax equity, taxes and the location of foreign operations, tax implications of dividend remittance by overseas affiliate, taxes and organizational form–controlled foreign corporation; Taxation of foreign source income in India; Transfer pricing (TP) and tax planning–TP methods, TP rules in India

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Eun C.S., Resnick B.G: "International Financial Management", Tata McGraw Hill Education Pvt. New Delhi 2010
2. Ephraim Clark: "International Financial Management", Cengage Learning. 2010
3. Sharan V., "International Financial Management", PHI Learnings, New Delhi, 2012.
4. V.A.Avadhani: "International Financial Management" Himalaya Publication, 2013
5. P.K.Jain, Surendra S Yadav, Peyrard: International Financial Mangement", MacMillon, 2013

6. Madhu Vij: "International Financial Management", Excel Books, New Delhi, 2011

7. G.Shailaja: "International Finance", University Press, New Delhi, 2011

8. Michael Melvin, Stefan C.Norrbin: "International Money and Finance", Elsevier, New Delhi, 2013

9. Shashi K Gupta, Praneet Rangi: "International Financial Management", Kalyani Publishers, New Delhi, 2013.

I – IV	L	P	Credits
	4	-	3

(FIN. ELECTIVE-IV)
FINANCIAL RISK MANAGEMENT

UNIT-I

Introduction to Risk Management**: C**oncept, nature and scope of risk. Possible risk events and risk indicators. Risk Management Process: pre-requisites and fundamentals misconceptions of risk. Types of risk: Product market risk and capital market risk. An integrated approach to corporate risk management and methods. Comprehensive view of Risk in Financial Institutions. Risk reporting process–internal and external.

UNIT-II

Measurement and Management of Risk: Value at risk (VaR): The concept, computation, stresses testing, back testing. Cash flow at risk (CaR): VaR and CaR to make investment decisions. Managing risk when risk is measured by VaR or CaR. Non-Insurance methods of Risk management vs. Risk avoidance, Loss Control, Risk retention and Risk transfer. Asset-Liability Management (ALM) evolution and RBI guidelines. Capital adequacy ratio Management of interest rate risk, liquidity risk, credit risk and exchange rate risk.

UNIT-III

Techniques and Tools of Risk Management: The concept and importance of Derivatives and types of Derivatives. The role of Derivative securities to manage risk and to exploit opportunities to enhance returns. Players in the stock/ derivative market: Individuals, speculators, hedgers, arbitrageurs and other participants in Derivatives Market.

Forward contracts: Definition, features and pay-off profile of Forward contract, Valuation of forward contracts. Forward Contracts to manage Commodity price risk, Interest rate risk and exchange rate risk- limitations of Forward contract. Futures contracts: Definition of future contracts. clearing house, margin requirements, marking to the market. valuation of futures contracts. Risk management with Futures contracts–the hedge ratio and the portfolio approach to a risk–minimizing hedge.

UNIT-IV

Techniques and Tools of Risk Management: SWAPS; Definition, types of swaps. Interest rate swaps, Currency swaps. Mechanics of Interest rate swaps .Using Interest rate Swaps to lower borrowing costs, hedge against risk of rising and falling interest rates. Valuation of interest rate Swaps. Pricing of Interest rate swaps at origination and valuing of Interest rate swaps after origination. Currency Swaps: Types of Currency Swaps. Valuation of currency swaps. Using Currency Swaps to lower borrowing costs in foreign country, to hedge against risk of a decline in Revenue, to hedge against risk of an increase in Cost, to hedge against risk of a decline in the value of an asset, to hedge against risk of a rise in the value of a liability. Pricing of currency swap at origination and valuing of currency swap after origination.

UNIT -V

Techniques and Tools of Risk Management: Options; Definition of an option. Types of options: call option, put option, American option and European option. Options in the money, at the money and out of the money. Option premium, intrinsic value and time value of options. Pricing of call and put options at expiration and before expiration. Options on stock indices and currencies. The Binominal option pricing model (BOPM): assumptions - single and two period models

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Vijayakumar P., Naidu.BVR, Venkateswarlu.Ch., Himalaya Publication, New Delhi.
2. Dun and Bradstreet: "Financial Risk Management", TMH, Delhi. 2011
3. Paul Hopkins, Kogan Page: "Fundamentals of Risk Management", Institute of Risk Management. 2010,
4. Jayanth Rama Varma: "Derivatives and Risk Management", TMH, 2012

5. Rajiv Srivastava:"Derivatives Valuation and Risk Management", Oxford University Press.2012
6. Jean-Philippe Bouchaud and Mark Potters: "Theory of Financial Risk and Derivative Pricing", Cambridge press 2013
7. John C. Hull & Sankarshan Basu, "Options, Futures and Other Derivatives",Pearson Education.
8. Taxmann: "Theory and Practice of Treasury and Risk Management in Banks", Indian Institute of Banking and Finance, March 2006,
9. Vivek, P.N.Asthana: "Financial Risk Management", HimalayaPublishing House,2012
10. DonM Chance, RobertBrooks: "An Introduction to Derivates and Risk Management", Cengage Learnings, 2013.
11. Dr. Vidyadhar Bhate: "Risk Management" Everest Publishing House, New Delhi, 2009
12. Dhanesh Kumar Khatri: "Derivatives and Risk Management" MacMillon,2012

I – IV	L	P	Credits
	4	-	3

(SYS-ELE.-III)

SOFTWARE PROJECT MANAGEMENT

UNIT-I

Conventional Software Management- Principles modern software management- Life cycle Phases –Artifacts of the Process – Model Based Software Architectures –Project organization and responsibilities. Traditional Project Management - Scoping the Project – Process Automation.

UNIT-II

Estimating Duration, Resource Requirements and Cost - Constructing and Analyzing the Project Network Diagram - Finalizing the Schedule and Cost Based on Resource Availability - Organizing and Conducting the Joint Project Planning Session- Case Studies.

UNIT-III

Recruiting Organizing and Managing the Project Team - Monitoring and Controlling Progress - Closing out the Projects - Critical Chain Project Management. Introduction to the Adaptive Project Framework - Version Scope - Cycle Plan - Cycle Build - Client Checkpoint - Post-Version Review - Variations to APF.

UNIT-IV

Model Based Software Architectures: Management Perspective and Technical Perspective. Software process Work flows – Checkpoints of the Process. Organizational Considerations - Project Portfolio Management - Project Support Office Process Control and Process Instrumentation

UNIT-V

Modern Project Profile: Continuous Integration – Early Risk Resolution – Evolutionary Requirements. Top ten Software Management Principles – Best Practices – Culture Shifts and Denouement.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Walker Royce: "Software Project Mangment", Pearson, New Delhi, 2013.
2. Mahapatra: "Software Project Management", Cengage Learning, New Delhi
3. Bob Hughes, Mike Cotterell: ***Software and Project Management***, TMH, New Delhi.
4. Maylor : ***Project Management***, Pearson Education.

I – IV	L	P	Credits
	4	-	3

(SYS-ELE-IV)
SYSTEMS AUDIT AND CONTROL

UNIT - I

Overview of Information System Auditing: Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

UNIT-II

The Management Control Framework-I: Introduction, Evaluation the Planning Function, Leading Function and Controlling Function, Systems Development - Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT -III

The Management Control Framework-II: Security Management Controls, Operations Management Controls Quality assurance Management Controls-Case Studies.

UNIT -IV

Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.

UNIT - V

Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency. Information Systems Audit and Management: Managing the Information Systems Audit Function,

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

REFERENCES

1. Ron Weber: "Information Systems Control and Audit", Pearson Education, 2013.

2. D P Dube: Information System Audit and Assurance, TMH, New Delhi, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA KAKINADA

MBA (REGULAR – R16) III SEMESTER SYLLABUS

STRATEGIC MANAGEMENT

UNIT 1

Introduction: Concepts in Strategic Management, Strategic Management as a process – Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Drafting a strategy - Industry and Competitive Analysis

UNIT 2

Environmental Scanning and leadership: Methods. SWOT Analysis –Strategies and competitive advantages in diversified companies and its evaluation. Strategic Analysis and Choice: Tools and techniques- Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

UNIT 3

Strategy Formulation : Strategy Framework For Analyzing Competition, Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

UNIT 4

Strategy Implementation : Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

UNIT 5

Strategy Evaluation and control – Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Strategic surveillance -strategic audit

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Vijaya Kumar P,. Hitt A: **Strategic Management**, Cengage learning, New Delhi,2010
2. John A PearceII, Amita Mital: "**Strategic Management**", TMH, New Delhi, 2012.

3. Sanjay Mohapatra: "**Cases Studies in Strategic Management**", Pearson, New Delhi,2012
4. Adrian Haberberg&Alison: **Strategic Management**, Oxford University Press, New Delhi, 2010
5. P.Subba Rao: "**Business Policy and Strategic Management**" Text and Cases, Himalaya Publishing House, New Delhi, 2011
6. .Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: "**Strategic Management and Business Policy"**, Excel Books, New Delhi, 2012

LEGAL ASPECTS OF BUSINESS

UNIT 1

Importance of Commercial Law: The Indian Contracts Act, 1872 – Nature of the Act and Classification of Contracts – Essentials of a Valid Contract – Offer and Acceptance – Capacity – Consideration –Free Consent –Legality of Object –Performance of a Contract – Discharge of a Contract – Breach of a Contract and Remedies.

UNIT 2

Sales of Goods Act: Distinction between Sales and Agreement to Sell – Conditions and Warranties – Performance of Contract of Sale –Transfer of Ownership – Rights of an Unpaid Seller. Consumer Protection Act, 1986: Consumer Right –Machinery for Redressal of Consumer Grievances.- Information Technology Act 2000.

UNIT 3

Contract of Agency: Kinds of Agents –Creation of Agency- Duties and Rights of Principal and Agents- Principal's Liability for the Acts of the Agent-Liability of Agent –Termination of Agency. Negotiable Instruments Act, 1881- Kinds of a Negotiable Instruments and endorsement-Presentation and discharge of Negotiable Instrument.

UNIT 4

Indian Partnership Act, 1932: Meaning and Essentials of Partnership- Registration – Tests of Partnership-Duties and Rights of Partners – Dissolution of Partnership.

UNIT 5

Company Act 1956: Nature and Types of Companies – Formation – Memorandum of Association-Articles of Association –Kinds of Shares –Duties of Directors-Winding up.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Ravindra Kumar: "**Legal Aspects of Business**", Cengage Learning, New Delhi, 2011
2. Kuchhal M C, Deepa Prakash: "**Business Legislation for Management**", Vikas Publishing House, New Delhi, 2012
3. Pathak: "**Legal Aspects of Business**", Tata McGraw Hill, New Delhi, 2010
4. S.N.Maheshwari, S.K.Maheshwari: "**A Manual of Business Laws**", Himalaya Publishing House, 2013.
5 P.K.Padhi: "**Legal Aspects of Business**", PHI Learnings, New Delhi, 2013

BUSINESS ETHICS AND CORPORATE GOVERNANCE

UNIT 1

Importance of Business Ethics: Values and Ethics- Business Ethics and Law – Ethics in Work Place – Ethical Decision Making- Theories of Business Ethics – Management and Ethics- Indian Ethical Traditions

UNIT 2

Impact of Globalization on Indian Business Ethics: Reasons for Unethical Practices among Indian companies – Development of Indian Capital Markets – Various studies on Ethical Attitudes of Managers Major Indian Scams

UNIT 3

Ethics in Marketing, HRM and Finance: Product safety and Pricing-Ethical responsibility in Product- Advertising and Target Marketing Ethics of sales, advertising and product placement and Consumer Autonomy. Ethics in HRM & Finance – HR related ethical issues - Institutional Culture – Frauds in Banks - Measures against Bank Frauds – Frauds in Insurance sector

UNIT 4

Corporate Governance: An overview – Theory and Practice of Governance- Indian model of Governance- Good Corporate Governance – Land marks in emergence of Governance OECB Principles – Sarbanes-Oxley Act 2002- SEBI Initiatives

UNIT 5

Corporate Governance Indian Scenario: Role of Government in Ensuring Corporate Governance – Governance issues relating to Board of Directors – Duties and responsibilities of Auditors – Governance under limited competition – Role of Media – Corporate Governance in Developing and Transiting Economies.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. S.K.Mandal: "**Ethics in Business and Corporate Governance**", TMH, New Delhi, 2012.
2. Marianne M Jennings: "**Cases in Business Ethics**", Cengage Learning, New Delhi, 2012.
3. S.Prabhakaran: "**Business Ethics and Corporate Governance**", Excel Books, New Delhi, 2011.
4. N.Balasubramanyam: "**A Case Book on Corporate Governance and Stewardship**", TMH., New Delhi, 2011.
5. A.C.Fernando: "**Business Ethics and Corporate Governance**", Pearson Publishers, New Delhi, 2013.

Electives - HR

LEADERSHIP MANAGEMENT

Unit 1:

Organisational Leadership: Definition,Components and evaluation of leadership,factors of leadership,Situational Leadership Behaviour: Meaning, Fiedler Contingency Model, Path Goal and Normative Models - Emerging Leadership Behaviour: Transformational, Transactional and Visionary Leadership - Leadership for the new Millennium Organisations - Leadership in Indian Organisations. Leadership Effectiveness: Meaning, Reddins' 3-D Model, Hersey and Blanchard Situational Model, Driving Leadership Effectiveness, Leadership for Organisational Building.

Unit 2:

Leadership Motivation, Culture: Motivation Theories for Leadership: Maslow's, Herzberg, X, Y and Z theories of Motivation - Similarities and Distinctions of Need Hierarchy and Two Factors theories. ERG – McClelland - Expectancy - Porter and Lawler Theories. - Emerging Challenges in Motivating Employees. Motivation,Satisfaction,Performance.Organisational Culture: Meaning, Definitions, Significance, Dimensions, Managing Organisational Culture, Changing organisational Cultural.

Unit 3:

Leadership Development: Leadership development: Significance – Continuous Learning: Principles of learning to develop effective leadership – Vision and Goals for organisation: significance of goals for leaders – Charting vision and goals of Indian leaders and abroad - Tools for developing dreams for effective leadership dreams – Leaders vision in organisation building – Leadership Attitude: significance – Developing and Maintaining positive attitude for effective leading.

Unit 4:

Strategic Leadership: Leader Self management: significance - Developing self esteem and balancing emotions – Interpersonal Leadership Skills: Praise – Criticise – Communicate – Leadership Assertiveness: Circle of influence and circle of concern – Leadership with Edification: Tools of edification – Leadership and creativity: Developing creative thinking – Leadership and Team Building: Principles of team building, individual versus Group versus Teams – Leadership and Integrity: Developing character and values.

Unit 5:

Leadership in the cross cultural context: Leadership across Globe: Characteristics - Significance – Functions – GLOBE research program of Wharton School – challenges of leadership in varying culture and values – Global perspectives of leadership – Leadership in USA – Leadership in Japan – European leadership – Leadership in Arab countries – Implications of global leadership – Leadership and Corporate Social Responsibility across globe.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Reference Books:

1. Peter G. Northouse, **Leadership**, 2010, Sage. Publication.
2. Richard L. Daft **"Leadership"** Cengage Learning 2005.
3. Uday Kumar Haldar **"Leadership and Team Building"** Oxford Higher Education 2010
4. Richard L Hughes, Robert C Ginnett, Gordon J Curphy **"Leadrship"** Tata Mc Graw Hill Education Private Limited 2012.
5. Peter Lornge, **Thought leadership Meets Business**, 1st edition, 2009, Cambridge.
6. John ADAIR, **Inspiring Leadership**, 2008, Viva Books.

COMPENSATION AND REWARD MANAGEMENT

UNIT 1

Compensation: concept and definition – objectives and dimensions of compensation program – factors influencing compensation –Role of compensation and Reward in Modern organizations-Compensation as a Retention strategy- aligning compensation strategy with business strategy – concept of reward - non-financial compensation system-Reward management process - Managing Compensation: Designing a compensation system – internal and external equity– pay determinants - frame work of compensation policy - influence of pay on employee attitude and behavior - the new trends in compensation management at national and international level.

UNIT 2

Job evaluation and Compensation Structure: Introduction to Principles and Procedures of job evaluation programs-Introduction to basic job evaluation methods-Compensation Structure-History and past practices, elements of ,management compensation –Types of compensation system, Role of compensation and Reward in modern organizations-compensation surveys-Incentive payments and its objectives.

UNIT 3

Wage and Salary administration: Nature and Purpose, Wage surveys-Administration of wage and salary-Principles-Components of wages-Theory of wages-Wage differentials-Importance-Wage differentials in India-Executive compensation plans-Legal frame work for wage and salary administration.

UNIT 4

Control systems for labour costs: Introduction-Direct and Indirect labour , Role of various departments-The personnel department-Industrial engineering department-Types of worker-Payroll department-Process and steps for preparation of payroll-Wage analysis-Cost accounting treatment of wages components-Compensation surveys-Profit sharing.

UNIT 5

Pay Structure and Tax Planning: Introduction- Compensation Structures-Performance based and Pay based structures-Designing pay structures-comparison in evaluation of different types of pay structures-Significance of factors affecting-Tax Planning –Concept of Tax planning-Role of tax planning in compensation benefits-Tax efficient compensation package-Fixation of tax liability salary restructuring.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Dr. Kanchan Bhatia **"Compensation Management",** Himalaya Publishing House, New Delhi 2012.
2. A.M.Sarma, N.Sambasiva Rao: "**Compensation and Performance management**", Himalaya Publishing House, Mumbai
3. Dewakar Goel:"**Performance Appraisal and Compensation Management**", PHI Learning, New Delhi, 2012
4. ER Soni Shyan Singh **'Compensation Management'** – Excel Books, New Delhi – 2008.

5. Mousumi S Bhattacharya Nilanjan Sengupta , **"Compensation Management"** – Excel Books, New Delhi – 2009

6. Tapomoy Deb **"Compensation Management"** – Excel Books, New Delhi – 2009

PERFORMANCE MANAGEMENT

Unit-1

Introduction: –Definition –concerns-scope-Historical developments in performance management-Over view of performance management-Process for managing performance-Importance –Linkage of PM to other HR processes-Performance Audit.

Unit-2

Performance Management Planning: Introduction-Need-Importance-Approaches-The Planning Process—Planning Individual Performance- Strategic Planning –Linkages to strategic planning-Barriers to performance planning-Competency Mapping-steps-Methods.

Unit-3

Management System: objectives – Functions- Phases of Performance Management System- Competency based Performance Management Systems- Reward based Performance Management Systems- Electronic Performance Management Systems- HR Challenges-Appraisal for recognistion and reward-Purpose of Appraising –Methods of Appraising-Appraisal system design-Implementing the Appraisal System-Appraisal and HR decisions.

Unit-4

Performance Monitoring and Counseling: Supervision- Objectives and Principles of Monitoring- Monitoring Process- Periodic reviews- Problem solving- engendering trust-Role efficiency- Coaching- Counseling and Monitoring- Concepts and Skills

Unit-5

Performance management skills – Operational change through performance management. High Performing Teams: Building and leading High performing teams – team oriented organizations – developing and leading high performing teams- Role of Leadership

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Prem Chadha: **"Performance Management**", Macmillan India, New Delhi, 2008.
2. Michael Armstrong & Angela Baron, **"Performance Management":** The New Realities, Jaico Publishing House, New Delhi, 2010.
3. T.V.Rao, **"Appraising and Developing Managerial Performance"**, Excel Books, 2003.
4. David Wade and Ronad Recardo, **"Corporate Performance Management"**, Butter Heinemann, New Delhi, 2002.
5. Dewakar Goel: **"Performance Appraisal and Compensation Management"**, PHI Leaarning, New Delhi, 2009
6. A.M. Sarma **"Performance Management Systems"** Himalaya Publishing House, New Delhi, 2010.

STRATEGIC HUMAN RESOURCE MANAGEMENT

UNIT-1

Human Resource Strategy: Introduction to Strategic Human Resource Management - Evaluation objectives and Importance of Human Resources Strategy- Strategic fit – A conceptual framework -Human Resources contribution to strategy - Strategy driven role behaviors and practices – Theoretical Perspectives on SHRM approaches - Linking business strategies to HR strategies.

UNIT-2

Strategic Human Resource Planning: Objectives, benefits, levels of strategic planning-Activities related to strategic HR Planning-Basic overview of various strategic planning models-Strategic HR Planning model-Components of the strategic plan.

UNIT-3

Strategy Implementation: Strategy implementation as a social issue-The role of Human Resource-Work force utilization and employment practices-Resourcing and Retention strategies-Reward and Performance management strategies.

UNIT-4

Strategic Human Resource Development: Concept of Strategic Planning for HRD-Levels in Strategic HRD planning-Training and Development Strategies-HRD effectiveness.

UNIT-5

Human Resource Evaluation: Overview of evaluation - Approaches to evaluation, Evaluation Strategic contributions of Traditional Areas - Evaluating Strategic Contribution of Emerging Areas-HR as a Profit centre and HR outsourcing strategy.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Charles R. Greer: **"Strategic Human Resource Management"** - A General Manager Approach - Pearson Education, Asia
2. Fombrum Charles & Tichy: **"Strategic Human Resource Management"** - John Wiley Sons, 1984
3. Dr. Anjali Ghanekar **"Strategic Human Resource Management"** Everest Publishing House, Pune 2009
4. Tanuja Agarwala **"Strategic Human Resource Management"** Oxford University Press, New Delhi 2014

5. Srinivas R Kandula **"Strategic Human Resource Development"** PHI Learning PVT Limited, New Delhi 2009
6. Dreher, Dougherty **"Human Resource Strategy"** Tata Mc Graw Hill Publishing Company Limited, New Delhi 2008

FINANCE

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Unit-I:

Concept of Investment Education: Investment Vs Speculation, Investment alternatives - Investment Process - Sources of Investment Information – Trading System in Stock Exchanges –Market Indices. Calculation of SENSEX and NIFTY - Return and Risk – Meaning and Measurement of Security Returns. Meaning and Types of Security Risks: Systematic Vs Non-systematic Risk - Measurement of Risk. (Problems)

Unit-II:

Equity and Bond Valuation Models – Preference Shares and Equity Shares Earning valuation-Cash flow valuation-Asset Valuation-Dividend-discount model; Valuation of Bonds – Bond Returns and Risks -Bond Pricing Theorems convexity, duration, bond immunization. (Problems)

Unit-III:

Investment Analysis: Fundamental Analysis – Economy, Industry and Company Analysis, Technical Analysis – Dow Theory – Elliot Wave Theory – Trends and Trend Reversals - Efficient Market Theory –Hypothesis- Forms of Market Efficiency.

Unit-IV:

Portfolio Analysis and Selection: Elements of Portfolio Management, Portfolio Models – Markowitz Model, Efficient Frontier and Selection of Optimal Portfolio. Sharpe Single Index Model and Capital Asset Pricing Model, Arbitrage Pricing Theory. (Problems)

Unit-V:

Portfolio Evaluation and Revision: Performance Evaluation of Portfolios; Sharpe Model – Jensen's Model for PF Evaluation, Evaluation of Mutual Fund – Portfolio Revision. (Problems)

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. S.Kevin: **"Security Analysis and Portfolio Management"**, PHI Learning, New Delhi, 2009

2. Punithavathy Pandian: **"Security Analysis and Portfolio Management"**, Vikas Publishing House, New Delhi, 2009

3. Sudhendra Bhat: **"Security Analysis and Portfolio Management"**, Excel Books, New Delhi, 2009.

4. Shashi K Gupta: **"Security Analysis and Portfolio Management"**, Kalyani Publishers, New Delhi,2010

5. Prasanna Chandra, **"Investment Analysis and Portfolio Management"**, 3/e Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 2003.

6. Ranganatham : **"Investment Analysis and Portfolio Management"** Pearson Education.

BANKING AND INSURANCE MANAGEMENT

UNIT 1

Introduction to Banking: Introduction to Indian Financial System - Meaning of a Bank and Customer- Bank and customer Relationship - Role of commercial banks in Economic Development - Evolution of Banking in India – origin, nationalization, reforms and Financial Inclusion in India - Financial statements of banks with special focus on Indian banks - Financial statement analysis of banks: CAMEL Approach, Key Performance indicators- Sources of Bank Funds.

UNIT 2

Uses of Bank Funds: Features of Bank Credit - types of lending - assessment of credit worthiness of a prospective borrower - management of credit process - different types of loans and their features - Loan Pricing: The basic model, pricing fixed & floating rate loans, cost-benefit loan pricing, Customer Profitability Analysis - Non Performing Assets: - gross and net concept of NPAs, causes, implications & recovery of NPAs.

UNIT 3

Regulation and Innovations in Banking System: Regulation of Bank Capital: The need to regulate Bank Capital - Concept of Economic Model - Concept of Regulatory Capital, Basel Accords I,II and III. - Banking Innovations - Core Banking Solution - Retail Banking - Products & Services: Nature, Scope, Future and Strategies - Plastic Money - National Electronic Funds Transfer - ATM - Mobile Phone Banking - Net Banking- Banc-assurance. Changing role of Banks as Financial Intermediaries. Customer service quality in Indian banking industry.

UNIT 4

Introduction to Insurance: Insurance as a Risk Management Tool- Principles of Insurance - Characteristics of Insurance contract - Functions of Insurers: Production, Underwriting, Rate Making, Managing Claims and Losses, Investment & Financing, Accounting & Record Keeping and other miscellaneous functions - Types of Insurers- Concept of Reinsurance, uses and advantages - Marketing channels: Agents & brokers –professionalism, remuneration, responsibilities, classification, criteria for appointment and capital adequacy norms for broker - an overview of IRDA.

UNIT 5

Life Insurance and General Insurance: The concept of Life Insurance - types of Life Insurance contracts - Tax treatment of Life Insurance- Life Insurance Products- Classification of Life Insurance - The Actuarial Science- Provisions of Life Insurance contracts - Special Life Insurance forms - Health and General insurance–Overview, Types, Third Party Administrators- Micro Insurance in India

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Peter.S.Rose & Sylvia. C. Hudgins: "**Bank Management & Financial Services**", Tata McGraw Hill New Delhi, 2010,
2. James S. Trieschmann, Robert E. Hoyt & David. W. Sommer B:"**Risk Management & Insurance**", Cengage Learning, New Delhi
3. Reddy K S and Rao R N: "**Banking & Insurance**", Paramount Publishing House 2013.
4. Vasant Desai: "**Banks & Institutional Management**", Himalaya Publishing House 2010.
5. Harold. D. Skipper & W. Jean Kwon: "Risk **Management & Insurance, Perspectives in a Global Economy**", Blackwell Publishing New Delhi.
6. NIA: "**Life Insurance Principles and Practices**", Cengage Learning, New Delhi,2013.
7. Neelam C.Gulati: **"Banking and Insurance: Principles and Practice"**, Excel Books, New Delhi 2011.

ADVANCED MANAGEMENT ACCOUNTING

Unit – 1:

Introduction: Employment of Management Accounting – Human Resource Accounting – Need for Harmonization of International Accounting Standards – Role of Management Accountant for controller functions – Financial Accounting Control (FACO)-Management information System.

Unit - 2:

Financial Analysis: Comparative analysis – Common Size Analysis - Funds Flow Analysis – Cash Flow Analysis.-Ratio Analysis – Trend analysis – Deprecation Models.

Unit- 3:

Budget – Budgetary Control: – Types of Budgets – Financial Vs Operation Budgets – Short Term Vs Long Term Budgets – Preparation of Sales Budgets – Purchase Budgets- Expenditure Budgets for Material, Labour and Overheads – Construction of Cash Budget- Flexible Budget – Master Budget – Management Control and Budgeting – Performance Budgeting and Zero Based Budgeting.

Unit-4:

Marginal Costing: Cost Concepts for Decision making – Decision Making Process – Decision Situations-Sales Volume Decisions – Pricing and Special Order Pricing – Make / Buy Decisions – Product Decisions- Addition, Deletion and Alteration of Mix – Plant Shutdown Decision - Profit Planning- introduction of new product – planning of level of activity – Key factor – Foreign market offer .

Unit – 5:

Standard Costing: Standard Costing and historical costing – Establishment of cost standards – steps involved in standard costing – Variance analysis: Material Variance – Labour Variance – Overhead Variance - Sales Variance

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Charles T. Horn Gaxy L. Sundem.: "**Introduction to Management Accounting"** Konrk Publishers PVT Ltd, New Delhi.
2. S.P. Gupta: "**Management Accounting"** Sahitya Bhawan Publications, Agra 2002.
3. Manmohan and Goyal: **"Management Accounting"** Pearson Education.
4. V. Krishna Kumar: **"Management Accounting"** Mittal Publications, New Delhi.
5. Dr. Kulsreshtha and Gupta: **"Practical Problem in Management Accounting"** Tata Mc Graw Hill, New Delhi.
6. S.P. Jain and K.L. Narang: **"Advanced Cost and Management Accounting"** Kalyani Publishers, New Delhi.

STRATEGIC FINANCIAL MANAGEMENT

Unit-I:

Corporate Policy: Strategic Financial Planning- changing complexion of regulatory framework - Shareholder Value Creation (SCV): Market Value Added (MVA) – Market-to-Book Value (M/BV) – Economic Value Added (EVA) – Managerial Implications of Shareholder Value Creation- Corporate Risk Management – Understanding the firms Strategic Exposure.

Unit-II:

Corporate Financial Strategies: Capital Structure Planning- EBIT,EPS,ROE analysis-Shareholders' Risk — Financial Options and Value of the Firm – Dividend Policy and Value of the Firm – Growth and External Financing Requirement. (Problems)

Unit-III:

Corporate Investment Strategy: Techniques of Investment Appraisal Under Risk and Uncertainty – Risk Adjusted Net Present Value – Risk Adjusted Internal Rate of Return – Capital Rationing – Decision Tree Approach for Investment Decisions – Evaluation of Lease Vs Borrowing Decision- Long term investment plans analysis with risk and return. (Problems)

Unit-IV:

Corporate Financial Engineering: Merger Strategy – Theories of Mergers – Horizontal and Conglomerate Mergers – Merger Procedure – Valuation of Firm – Financial Impact of Merger – Merge and Dilution Effect on Earnings Per Share – Merger and Dilution Effect on Business Control. (Problems)

Unit-V:

Corporate Restructuring: Takeover Strategy – Types of Takeovers – Negotiated and Hostile Bids – Takeover Procedure – Takeover Defenses – Takeover Regulations of SEBI – Distress Restructuring Strategy – Sell offs – Spin Offs – Leveraged Buyouts- Buy back shares – Alignment of Interest – Corporate Governance . (Problems)

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Coper and Weston: **"Financial Theory and Corporate Policy"**
2. Braley and Myers: **"The Principles of Corporate Finance"**. Mc.Graw Hill, N.Y.1993.
3. Prasanna Chandra : **"Financial Management"** Theory and Practice.
4. I.M. Pandey – **"Financial Management"** Vikas Publishers, New Delhi.

MARKETING

CONSUMER BEHAVIOR

UNIT- 1

Introduction to Consumer Behavior: Understanding consumers and market segments. Evolution of consumer behavior, consumer analysis and business strategy. Models of Buyer Behavior, Howard Model, Howard- Sheth Model, EKB Model, Webster and Wind Model and Sheth Industrial Buyer Behavior Model.

UNIT- 2

Psychological Foundations of Consumer Behavior: Consumer Motivation, Perception, Personality and Behavior, Learning and Behavior Modification, Information Processing, Memory Organization and Function, Attitude Formation and Attitude Change. Social and Cultural Environment Economic, Demographic, Cross Cultural and Socio–Cultural Influences, Social Stratification, Reference Groups and Family, Personal influence.

UNIT- 3

Communication and Consumer Behavior: Components of communications process, designing persuasive communication and Diffusion of Innovations. Consumer Decision Processes High and Low Involvement, Pre-purchase Processes, Post Purchase processes, Consumption and evaluation, Brand Loyalty and Repeat Purchase Behavior.

UNIT -4

Consumerism: The roots of consumerism, consumer safety, consumer information, environmental concerns, consumer privacy, legislative responses to consumerism and marketer responses to consumer issues.

UNIT- 5

Consumer Protection: Consumer Protection Act 1986, Central consumer protection council, state consumer protection councils, consumer disputes redressal agencies, consumer disputes redressal forum, National Consumer Disputes Redressal Commission.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Ramneek Kapoor, Nnamdi O Madichie: **"Consumer Behavior"** Text and Cases", TMH, New Delhi, 2012.
2. Ramanuj Majumdar: **"Consumer Behavior insight from Indian Market"**, PHI Learning, New Delhi, 2011
3. M.S.Raju: **"Consumer Behavior Concepts, applications and Cases"**, Vikas Publishing House, New Delhi, 2013.
4. David L Loudon and Albert J Della Bitta, **"Consumer Behavior"** 4/e, TMH, New Delhi, 2002.
5. Schiffman, L.G and Kanuk L.L **"Consumer Behavior"**, 8/e, Pearson Education, New Delhi, 2003.

RETAIL MANAGEMENT

UNIT 1

Basic concept of retailing: Retail development – types and functions of retailers – multi channel retailing – organized retailing in India – special characteristics of retailing services retailing- legislation for retailing in India.

UNIT 2

Retail strategy: market strategy – retail format and target market – building sustainable competitive advantage – growth strategies – strategic retail planning process.

UNIT 3

Retail location – Types, location opportunities – selection of location and Site analysis - financial strategy – strategic profit model – setting and measuring performance objectives.

UNIT 4

Store layout and design: Store operations and inventory management- Merchandise planning and control - Buying merchandise – Developing Assortment plan.

UNIT 5

Retail Pricing Strategy:, Category Management, Customer services – Retail branding - International retailing – Promotional strategies – advertising, sales promotion, Store atmosphere.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Sheikh and Kaneez Fatima, "**Retail Management**", Himalaya Publishing House, Mumbai, 2012
2. A.J. Lamba:"**The Art of Retailing**", Tata McGraw Hill Education Pvt. Ltd. New Delhi.2011
3. Sivakumar, A, "**Retail Marketing**", Excel Books, New Delhi, 2007
4. Swapna Pradhan, "**Retail management**", Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2012
5. Berman Barry, Joel R. Evans and Mini Mathur, "**Retail Management-A Strategic Approach**", Pearson Education, New Delhi, 2011.
6. Chetan Bajaj RajnishTuli, Nidhivarma Srivastava:"R**etail Management**", Oxford University Press, New Delhi, 2012.

CUSTOMER RELATIONSHIP MANAGEMENT

UNIT 1

Introduction: Definition of CRM –Elements of CRM – CRM Processes and systems, Importance of CRM, Critical success factors for a winning CRM program – Advantages of CRM – Integrated CRM system –Planning and Managing CRM Programme - Application areas.

UNIT 2

CRM as an integrated business strategy: Nature of CRM strategy – Contents of CRM Strategy – Description of Customer – Supplier Relationships, The dynamics of Relationships, The relationship oriented organization.

UNIT 3

CRM marketing aspects: Customer knowledge, value of customer knowledge, utilization of data as an asset, multi-channels and communication- Influence of the channels on pricing and the formation of relationships – The relationship policy to improve size, quality and relationship with the customer base.

UNIT 4

Analytical CRM: Relationship data management – Expanding the size of customer database - Data analysis and data mining – Concept of customer loyalty – customer value assessment – Customer Retention strategies – Retention and Cross – sell analyses – effect of marketing activities – Reporting the results

UNIT 5

Operational CRM and CRM implementation: Call center Management – internet and the websites – traffic building – Providing quality during the visit to the website – Process of developing, producing, sending and following – up direct mailings. Causes for disappointing CRM results – The best CRM implementation strategies –Privacy and ethics Consideration in CRM implementation.

References:

1. Ed Peelen: **"Customer Relationship Management"** Pearson, Education

2. Roger J Baran, Robert J Galka and Daniel P Strunk: **"Customer Relationship Management"** Cengage learning

3. S.Shanmuga sundaram: **"Customer Relationship Management"** Prentice Hall of India.

STRATEGIC MARKETING MANAGEMENT

UNIT – 1

Introduction : Role of Strategic Marketing - Key Definitions of Strategic Marketing - Role and Importance and concepts- Systematic approach - sequencing and scheduling of activities and integration of activities - Resource Requirements – Time scaling - Processes: Strategic Marketing Planning Process - Strategic Marketing Analysis- marketing strategy objective setting- perceptual mapping - factor analysis, Option Evaluation, Choice – Formulation and Implementation and Control Links to corporate strategy: Mission statement, organisational structure and corporate responsibility and ethics - dynamic strategy

UNIT -2

Strategic Marketing Strategy: Models - Organisation, Industry and market environment situation analysis; Porter's Five Forces model - Structure, Conduct and Performance; - Marketing Audit - portfolio analysis techniques -strategic positioning, defining the future position - Marketing Tactics - Product tactics -Price tactics- Promotion tactics - Place tactics- Direct response marketing strategies - Defensive strategies - Customer retention strategies- Personalised marketing; Payne and Ballantyne's Six markets model

UNIT -3

Strategic Marketing Techniques : Setting marketing objectives and marketing strategy - Targeting markets - Segmenting markets - Profiling markets- Positioning segmented markets, Direct or Indirect sales Strategy options - core competences - Competitive advantage - Investment opportunity evaluation - market leadership - Innovation strategies - Market pioneer - close followers, late followers; offensive, defensive and value-based marketing strategies Strategic marketing objectives: marketing mix – 7 Ps.

UNIT -4

Strategic marketing environment : Changes in the external environment: shift from supply to demand environment; fashionisation of markets; micro-markets; rising expectations; technological change; competition; globalisation; importance of customer service; commoditisation; erosion of brands; new constraints Strengths and weaknesses: focus of marketing objectives, links to corporate strategy.

UNIT - 5

New Product Developments: Ability to customize - Ability to handle information to gain competitive advantage - e-marketing position - core focus - target markets, nature and potential of key market segments, partnerships with customers and other stakeholders- Innovation strategies, timescales, resource requirements, budgets, monitoring, review and control mechanisms Strategic marketing responses: emerging themes eg impact of globalisation, the

strength or weakness of competitors, importance of environmental factors, changes in the political environment, the state of the economy, the exchange rate, health and safety factors

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Devid A Aaker and Damien Mc Loughlior: **"Strategic Marketing Management**"- Global Perspective" Wiley Publications.
2. Jean –Jacques Lambin : **"Strategic Marketing Management"**, McGraw –Hill,
3. Nag A: **"Strategic Marketing"**. MacMillons
4. Srinivas R, Lohith C.P.: **"Strategic Marketing and Innovation**" for Indian MSMEs", Springer Publication.
5. Graeme Drummond, John Ensor, Ruth Ashfor: **"Strategic Marketing Planning and Control"**, Elsevier Publication.
6. Kotler P and Keller K L: **"A Framework for Marketing Management"**, Pearson Education, 2008

SYSTEMS

E-BUSINESS

UNIT 1

Introduction to E-Business: Transitioning to the Web – E-Business and E-Commerce overview History of Internet and World Wide Web – Web development Internet and World Wide Web Resources. A Framework for understanding E-Business.

UNIT 2

E-Business Models: Storefront Models, Auction Model, Portal Model and Dynamic-Pricing Models. B2B E-Commerce and EDI. Understanding Online Communication and Behavior. Creating the Marketing Mix – Organizational and Managerial Issues. Implementation and Control of the E-Business Plan.

UNIT 3

Building an E-Business: Design and Development and Management – E-Business Solutions - Online Monetary Transactions. e-Wallets – Digital Currency and Alternate Consumer Payment Options .Smart Cards, e-Billing developing payment standards.

UNIT 4

Internet Marketing: Branding, Promotions, E-Business Advertising – E-Customer Relationship Management – Tracking and Analyzing data, Personalization – Contact Centers Complete e-CRM Solutions

UNIT 5

Legal and Ethical Issues: Privacy and confidentiality on the Internet Other Legal areas like Defamation IPR and Patents, Trade mark Unsolicited Commercial e-Mail (Spam) Online Contracts and User Agreements. Cyber Crime – Internet Taxation Issues

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Hanson: **"E-Commerce and Internet Marketing"**, Cengage Learning, New Delhi, 2013
2. Harvey M. Deitel, Paul J. Deitel, Kate Steinbuhler: **"E-Business and E-Commerce"** for Managers, Pearson Publication.
3. David Whiteley: **"E-Commerce- Strategy Technologies and Applications"** Tata Mac-Graw Hill, New Delhi, 2000.
4. C.S.V.Murthy: **"E-Commerce–Concepts, Models & Strategies"** Himalaya Publishing house, Mumbai, 2003.
5 Kamalesh K Bajaj & Debjani Nag: **"E-Commerce"**, the Cutting Edge of Business- Tata McGraw- Hill, New Delhi, 2002.
6. Bharat Bhaskar: **"Electronic Commerce"**,Tata Mc-Graw-Hill, New Delhi, 2003.

RELATIONAL DATA BASE MANAGEMENT SYSTEMS (RDBMS)

UNIT - 1

Database Systems: Evolution- File Oriented Systems- Database Models- database System Components- Database Systems in the Organization- Data sharing - Strategic Database - Planning database and Management Control- Risks and Costs in Databases- Database development.

UNIT - 2

Database Design: Principles of Conceptual Database- Design Conceptual Data Models- Aggregation- Modeling conceptual Objects vs. Physical Objects- Relational Data Model- Fundamental Concepts-Normalization-Transforming a conceptual model - Relational Model- Relational Database Implementation- Relational Algebra and Calculus.

UNIT - 3

SQL-Schema and Table Definition: Data Manipulation- View Definition Graphical Query Language- Client-Server Databases - Defining Database Tables and Server - Data Manipulation and Programming- Developing Client Applications

UNIT - 4

Physical Database Systems: Storage Media- Disk Performance – Factors File Organisation- Implementing Logical Relationships- Mapping logical Data Structures to Physical Structures- Secondary Keys – Access Database Administration and Control - DBA Functions- DBA Goals Database Integrity- Database Security- Database Recovery

UNIT - 5

Distributed Database Systems: Design.- Query Processing- Data Integrity Recovery- Client/Server Systems- DBMS Selection and Implementation- Information Needs- DBMS Functions and Capabilities-Classifying DBMS feature requirement Evaluation Models- Implementation Issues- Case studies of RDBMS package such as ORACLE/MS-SQL Server.

(Lab Sessions to be conducted wherever it is required)

REFERENCES:

1. Mc Fadden-Benjamin: **"Modern Database Management"** Cummings Publishing Company

2. Bipin C.Desai: **"An Introduction to Database System"** West Publishing Company

3. Gary Hansen & James. Hansesn: **"Database Management & Design"** Prentice Hall

4. Alexis Leon & C.K. Thomas DB2 (IBM Database 2), **"The Complete Book for Application Programmers"**, Comdex Computer Publication a division of Pustak Mahal.

5. Prof. S. Nandagopalan, **"Database Management Systems**" A Practical Approach", Sapna Book House, Bangalore.

WEB DESIGNING

Unit: 1

Web Fundamentals – Introduction To The Web, History of the Web, Protocols Governing the Web, Creating Websites for Individuals and the Corporate World, Web Applications, Writing Web Projects, Identification of Objects, Target User, Web Team, Planning and Process Development, Web Architecture, Major Issues in the Web Solutions Development, Web Servers (Apache Web Server), Web Browsers, Internet Standards, TCP/IP Protocol Suite, IP Addresses, MIME, Cyber Laws.

Unit: 2

Hyper Text Transfer Protocol (HTTP): Introduction - Web Server and Clients, Resources, URL and its Anatomy – Examples, Message Format, Persistent and Non-Persistent Connections, Web Caching, Proxy. Java Network Programming- Java and the Net, Java Networking Classes and Interfaces, Looking up Internet Address, Client/Server Programs, Socket Programming, E-mail Client.(lab sessions to be conducted)

Unit 3

Hyper Text Markup Language (HTML): Introduction, Structure, Text, Lists, Links, Images, Tables, Forms, Frames, Images, and Meta Tags. (lab sessions to be conducted)

Unit 4

Cascading Style Sheets (CSS) Introduction, Advantages, Color, Text, Boxes, Lists, Tables and Forms, Layout, Images, HTML5 Layout. (Lab Sessions to be conducted)

Unit 5

JavaScript Introduction, Variables, Literals, Operators, Control Structure, Conditional Statements, Arrays, Functions, Objects, JavaScript and HTML DOM, Advanced JavaScript and HTML Forms (Lab sessions to be conducted).

(Lab Sessions to be conducted wherever it is required)

TEXT BOOKS:

1. Uttam K Roy : **"Web Technologies"** — Oxford University Press, 2010
2. Jon Duckett: **"HTML & CSS: Design and Build Websites"** – John Wiley & Sons, 2014.

SYSTEMS ANALYSIS AND DESIGN

UNIT-1

Systems Analysis and Design: Meaning - System Analyst: Role and Responsibilities. Strategies of System Design and Development - Principles of System Development - Tools of System Development - Requirements Analysis: Strategies - Fact-finding – Feasibility Analysis - Documenting: DFD, DD, DT, Decision Trees,

UNIT-2

System Design: Objectives - Physical Vs. Logical Design- Areas of System Design: Input Design: Date Capture - GUI controls - prototype design - Process Design - Modeling Applications - Information Technology Architecture - Output Design - Principles - Prototype – Interface – Display – Forms Design.

UNIT-3

Procedure Design: Code Design – File Design – Methods – Storage Structures – Software Design – Techniques – Principles.

UNIT-4

System Testing: Types – Approaches – Quality Assurance – Assessing Reliability – Documentation – Training the users and operating personnel.

UNIT-5

System Implementation: Strategies and Techniques Conversion Methods – System support and maintenance system crash – Recovery- System Evaluation Techniques.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Whitten.L. Jeffery: Bentley. D. Lonnie: **"System Analysis and Design Methods"** Tata Mc. Graw Hill, New Delhi.
2. Senn. A.James: **"Analysis and Design of Information System"** Mc. Graw Hill, New York.
3. Davis. B. Gordeon, Olson, H.Margrethe: **"Management Information Systems"** Conceptual Foundations, Structure and Development, Mc.Graw Hill, New York.
4. Garg.K.Vinod, Srinivasan, S: **"Work book on Systems Analysis & Design"** Prentice Hall of India Pvt. Ltd., New Delhi.
5. Rajaraman, V. **"Analysis and Design of Information System"** Prentice Hall of India Pvt. Ltd., New Delhi.
6. Vigya Charya R. Bansal, **"Information System Analysis and Design"** A Modern Approach to System Development, New Age International Publishers, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA: KAKINADA
SCHOOL OF MANAGEMENT STUDIES

MBA (REGULAR – R16) IV SEMESTER SYLLABUS

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

UNIT 1

Logistics and Competitive strategy: Competitive advantage – Gaining Competitive advantage through logistics-Integrated supply chains– Competitive performance - Models in Logistics Management - Logistics to Supply Chain Management – Focus areas in Supply Chain Management.- Customer service and retention- Basic service capability Value added services

UNIT 2

Measuring logistics costs and performance: The concept of Total Cost analysis – Principles of logistics costing – Logistics and the bottom-line – Impact of Logistics on shareholder value - customer profitability analysis –direct product profitability – cost drivers and activity-based costing.

UNIT 3

Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operations –Mapping the supply chain processes – Supplier and distributor benchmarking – setting benchmarking priorities –identifying logistics performance indicators –Channel structure – Economics of distribution –channel relationships –logistics service alliances.

UNIT 4

Sourcing, Transporting and Pricing Products: sourcing decisions and transportation in supply chain – infrastructure suppliers of transport services – transportation economics and pricing – documentation - pricing and revenue management Lack of coordination and Bullwhip Effect - Impact of lack of coordination. - CRM –Internal supply chain management - .

UNIT 5

Managing global Logistic: Logistics in a global economy – views of global logistics- global operating levels – interlinked global economy – Global strategy –Global purchasing – Global logistics – Channels in Global logistics –Global alliances.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Donald J.Bowersox and David J.Closs: “Logistical Management” The Integrated Supply Chain Process, TMH, 2011.
2. Edward J Bradi, John J Coyle: “ A Logistics Approch to Supply Chain Management, Cengage Learning, New Delhi, 2012.

3. D.K.Agrawal: “Distribution and Logistics Management”, MacMillan Publishers, 2011
4. Sunil Chopra and Peter Meindl: “Supply chain Management: Strategy, Planning and Operation”, Pearson Education, New Delhi 2013
5. Rahul V Altekar: Supply Chain Management, PHI Learning Ltd, New Delhi, 2009

ENTREPRENEURSHIP DEVELOPMENT

UNIT 1

Entrepreneurship: Importance and growth - Characteristics and Qualities of Entrepreneur- Role of Entrepreneurship, Ethics and Social Responsibilities. Women Entrepreneurship: Role & Importance, Problems of Women Entrepreneurs – corporate entrepreneurship – mobility of entrepreneur – entrepreneurial motivation.

UNIT 2

Training: Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit - Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees. Creativity and Entrepreneurship: Sources and Methods of Ideas Planning and Development of Programmes

UNIT 3

Planning and Evaluation of Projects: Growth of Firm – Project identification and selection - Factors inducing growth- - Project Feasibility Study - Post Planning of Project-Project Planning and Control.

UNIT 4

Small and Micro Enterprises: Importance, definitions – policies and their support to MSMEs - growth and growth strategies – sickness in small business and remedies – small entrepreneurs in International business.

UNIT 5

Institutional Support to Entrepreneur and MSMEs: Role of Government - Role of IDBI, NIESBUD, SISI, DIC - Financial Institutions-Commercial Banks, Entrepreneurial Development Institutes, Universities and other Educational Institutions offering Entrepreneurial Development Programme.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Arya Kumar: “Entrepreneurship”, Pearson, Publishing House, New Delhi, 2012.
2. VSP Rao, Kuratko: “Entrepreneurship’, Cengage Learning, New Delhi,
3. K.Ramachandran: “Entrepreneurship Development”, TMH, New Delhi, 2012
4. B.Janakiram, M Rizwana: “Entrepreneurship Development” Excel Books, New Delhi, 2011
5. Rajeev Roy: “Entrepreneurship”, Oxford University Press, New Delhi,2012
6. P.C.Shejwalkar: “Entrepreneurship Development”, Everest Publishing House, New Delhi, 2011

HR ELECTIVE 5

ORGANIZATIONAL DEVELOPMENT & CHANGE MANAGEMENT

UNIT 1

Basics of Change Management: Meaning, nature and Types of Change – change programmes – change levers – change as transformation – change as turnaround – value based change.

UNIT 2

Mapping change: The role of diagramming in system investigation – A review of basic flow diagramming techniques –systems relationships – systems diagramming and mapping, influence charts, multiple cause diagrams- a multidisciplinary approach -Systems approach to change: systems autonomy and behavior – the intervention strategy model – total project management model (TPMM). Learning organization: The relevance of a learning organization - strategies to build a learning organization

UNIT 3

Organization Development (OD): Meaning, Nature and scope of OD - Dynamics of planned change – Person-focused and role-focused OD interventions –Planning OD Strategy – OD interventions in Indian Organizations – Challenges to OD Practioners

UNIT 4

Negotiated Change: Change in the labour - management relations in the post-liberalized India – collective bargaining strategy to the challenges of Globalization and the restructuring of enterprises in India - Changes in the legal frame work of collective bargaining - Negotiated flexibility, productivity bargaining, improved work relations, public sector bargaining and social security.

UNIT 5

Team Building: Nature and Importance of Teams – Team Vs Groups – Types of teams – Characteristics of Virtual teams – Team building life cycle – Team building skills – Virtual team - High performance teams – self managing teams – Building team relationships – empowered teams – leadership on teams – Managing cross –cultural diversity in teams – Group think as a decision making process – effective decision making techniques for teams and groups – role of change consultant-– contemporary issues in managing teams.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Cummings: "Theory of Organisation Development and Change", Cengage Learning, New Delhi, 2013.
2. Robert A Paton: Change Management, Sage Publications, New Delhi, 2011.
3. NilanjanSengupta: Managing Changing Organisations, PHI Learning, New Delhi, 2009
4. Adrian Thornhill: Managing Change, Pearson Education, New Delhi, 2012.
5. Radha R Sharma: Change Management, TMH, New Delhi, 2012

HR ELECTIVE 6

Global HRM

UNIT 1

Introduction: A Global HR Perspective in New Economy-Challenges of Globalization - Implications of Managing People and Leveraging Human Resource- - Conflicts - Strategic Role of International HRM – Global HR Planning – Staffing policy – Training and development – performance appraisal –International Labour relations – Industrial democracy – Talent crunch – Indian MNCs and Challenges - Legal content of Global HRM.

UNIT 2

Managing International Assignments: Significance – Selection methods - Positioning Expatriate – Repatriate – factors of consideration - Strategies - International assignments for Women - Problems.

UNIT 3

Cross Culture Management: Importance – Concepts and issues – theories- considerations - Problems – Skill building methods – Cross Culture Communication and Negotiation – Cross Culture Teams.

UNIT 4

Compensation Management: Importance – Concepts- Trends - Issues – Methods – Factors of Consideration – Models – incentive methods – global compensation implications on Indian systems - Performance Management.

UNIT 5

Global Strategic Advantages through HRD: Measures for creating global HRD Climate – Strategic Frame Work of HRD and Challenges - Globalization and Quality of Working Life and Productivity – Challenges in Creation of New Jobs through Globalization- New Corporate Culture

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Subba Rao P: "International Human Resource Management", Himalaya Publishing House, Hyderabad, 2011
2. NilanjanSen Gupta: "International Human Resource Management Text and cases" Excel Books, New Delhi.
3. Tony Edwards :"International Human Resource Management", Pearson Education, New Delhi, 2012
4. Aswathappa K, Sadhana Dash: "International Human Resource Management, TMH, New Delhi,
5. Monir H Tayeb: "International Human Resource Management", Oxford Universities Press, Hyderabad, 2012.

HR ELECTIVE 7

LABOR WELFARE & LEGISLATION

UNIT 1

Welfare Legislation: Factories Act 1948, Mines Act 1952, Plantation Labour Act 1951, Contract Labour (Regulation and Abolition) Act 1970 and A.P.Shops and Establishments Act.

UNIT 2

Industrial Relations Legislation: Industrial Disputes Act 1947; Industrial Employment (standing orders) Act 1946 and Trade Unions Act 1926.

UNIT 3

Wage and Social Security Legislation: Payment of wages Act 1936 - Minimum wages Act 1948 - Payment of Bonus Act 1966 -. Payment of Gratuity Act 1972 - Workmen's Compensation Act 1923 - Employees State Insurance Act 1948 - Maternity Benefit Act 1961 and Employees Provident Fund and Miscellaneous Provisions Act 1952.

UNIT 4

Labour Welfare: Concept, scope and philosophy, principles of labour welfare, Indian constitution on labour, Agencies of labour welfare and their role. Impact of ILO on labour welfare in India. Labour problems – Indebtedness, Absenteeism, Alcoholism, Personal and Family Counselling.

UNIT 5

Labour welfare programmes: Statutory and non-statutory, extra mural and intra mural, Central Board of Workers' Education; Workers' Cooperatives; Welfare Centers, Welfare Officers' Role, Status and Functions. Role of social work in industry.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Govt. of India (Ministry of Labour, 1969). Report of the Commission on Labour Welfare, New Delhi: Author.
2. Govt. of India (Ministry of Labour, 1983). Report on Royal Commission on Labour in India, New Delhi: Author.
3. Malik, P.L: "Industrial Law", Eastern Book Company. Laknow,1977
5. Moorthy, M.V: "Principles of Labour Welfare", Oxford University Press, New Delhi.
6. Pant, S.C: "Indian Labour Problems", Chaitanya Pub. House. Allahabad.

HR ELECTIVE 8
MANAGEMENT OF INDUSTRIAL RELATIONS

UNIT 1

Industrial Relations Management: Concept- Evaluation –Background of industrial Relations in India- Influencing factors of IR in enterprise and the consequences. Economic, Social and Political environments- Employment Structure –Social Partnership-Wider approaches to industrial relations- Labour Market.

UNIT 2

Trade Unions: Introduction-Definition and objectives-growth of Trade Unions in India-trade Unions Act , 1926 and Legal framework-Union recognition-Union Problems-Employees Association-introduction ,Objective Membership, Financial Status.

UNIT 3

Quality of Work Life: Workers' Participation in Management - Worker's Participation in India, shop floor, Plant Level, Board Level- Workers' Welfare in Indian scenario- Collective bargaining concepts & Characteristics –Promoting peace.Wage and Salary administration: Nature & Significance of wage, salary administration, essentials- Minimum wage- Fair wage, Real wage, Incentives & fringe benefits. Issues and Constraints in Wage Determination in India.

UNIT 4

Social Security: Introduction and types –Social Security in India, Health and Occupational safety programs- Salient features of Workmen Compensation Act and Employees' State Insurance Act relating to social security – Workers' education objectives -Rewarding.

UNIT 5

Employee Grievances: Causes of Grievances –Conciliation, Arbitration and Adjudication procedural aspects for Settlement of Grievances –Standing Orders- Code Discipline. Industrial Disputes: Meaning, nature and scope of industrial disputes - Cases and Consequences of Industrial Disputes –Prevention and Settlement of industrial disputes in India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. C.S Venkataratnam: "**Industrial Relations**", Oxford University Press, New Delhi, 2011
2. Sinha: "**Industrial Relations, Trade Unions and Labour Legislation**", Pearson Education, New Delhi, 2013
3. Mamoria: "**Dynamics of Industrial Relations**", Himalaya Publishing House, New Delhi, 2010
4. B.D.Singh: "**Industrial Relations**" Excel Books, New Delhi, 2010
5. Arun Monappa: "**Industrial Relations**", TMH, New Delhi. 2012
6. Prof. N.Sambasiva Rao and Dr. Nirmal Kumar: "**Human Resource Management and Industrial Relations**", Himalaya Publishing House, Mumbai
7. Ratna Sen: "**Industrial Relations**", MacMillon Publishers, New Delhi, 2011

FINANCE ELECTIVE 5

FINANCIAL MARKETS AND SERVICES

UNIT 1

Structure of Financial System: Role of Financial System in Economic Development – Financial Markets and Financial Instruments – Capital Markets – Money Markets – Primary Market Operations – Role of SEBI – Secondary Market Operations – Regulation – Functions of Stock Exchanges – Listing – Formalities – Financial Services Sector Problems and Reforms.

UNIT 2

Financial Services: Concept, Nature and Scope of Financial Services – Regulatory Frame Work of Financial Services – Growth of Financial Services in India – Merchant Banking – Meaning-Types – Responsibilities of Merchant Bankers – Role of Merchant Bankers in Issue Management – Regulation of Merchant Banking in India.

UNIT 3

Venture Capital: Growth of Venture Capital in India – Financing Pattern under Venture Capital – Legal Aspects and Guidelines for Venture Capital, Leasing – types of Leases – Evaluation of Leasing Option Vs. Borrowing.

UNIT 4

Credit Rating: Meaning, Functions – Debt Rating System of CRISIL, ICRA and CARE. Factoring, Forfeiting and Bill Discounting – Types of Factoring Arrangements – Factoring in the Indian Context;

UNIT 5

Mutual Funds: Concept and Objectives, Functions and Portfolio Classification, Organization and Mangement, Guidelines for Mutual Funds, Working of Public and Private Mutual Funds in India. Debt Securitisation – Concept and Application – De-mat Services-need and Operations-role of NSDL and CSDL.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Bhole & Mahakud, Financial Institutions and Market, TMH, New Delhi
2. DK Murthy, and Venugopal, Indian Financial System, IK Int Pub House
3. Anthony Saunders and MM Cornett, Fin Markets & Institutions,TMH, ND
4 Edminister R.D., Financial Institution, Markets and Management:
5. Punithavathy Pandian, Financial Markets and Services, Vikas, New Delhi
6. Vasanth Desai, Financial Markets & Financial Services, Himalaya, Mumbai

FINANCE ELECTIVE 6

GLOBAL FINANCIAL MANAGEMENT

UNIT 1

Introduction to Global Financial Management: Globalization and MNCs- Global Winds of Change- New Challenges and Opportunities- Importance of Global Factors- Regulatory and Legal Frame Work- Global Organizational Restructuring- International Monitory System- Exchange Rates and Par Values- International Monitory Reforms- Special Drawing Rights (SDR) –SDR Allocation.

UNIT 2

Management of Exchange and Interest Rates Exposure: Determination of Exchange Rates- Balance of Payments (Equilibrium vs Disequilibrium)- International Trade Flow- Time factor in International Risks- Hedging in Swap Market- Measurement of Politico Economics Risk- Management of International Transactions Exposure.

UNIT 3

Management of Global Business Operations and Practices: Operational Strategies of MNCs- Management of Global Business Practices- Sources of funds for MNCs- Operations in International Financial Markets- Inter-Corporate Funds Flow- Market for Currency Futures and Currency Options.

UNIT 4

International Investment Decision : Foreign Direct Investment- International Capital Budgeting- Evaluation and Management of Political Risk- Global Portfolio Investment- International Global Financial Decisions- Role of Multi Lateral Development Banks- Global Financial Market Instruments- Management of Interest Rate Risk- Shorter Asset and Liability Management.

UNIT 5

Global Indebtedness: External Resources and Development- Nature and Magnitudes of External Debt- Factors influencing Debt Crisis- Management of external Indebtedness and Challenges- Short -Term Financing- Internal Financing by MNCs.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Jeff Madura, " International Financial Management" Cengage Learning Limited, 2008.
2. PG Apte, "International Financial Management" Tata McGraw Hill Limited, 2009.
3. Vyuptakesh Sharan, "International Financial Management" PHI, 2012.
4. V.A. Avadhani, "International Financial Management" Himalaya Publishing House, 2009

FINANCE ELECTIVE 7

RISK MANAGEMENT

UNIT1

Introduction to Risk Management: Role of Financial Institutions- Future Trends and Global Issues- Financial Services provided by Intermediaries- Need of Risk Management- What is Risk- Sources of various Risk- Risk Management frame work in Organization- Identification of Risks like Liquidity Risk, Market Risk, Foreign Exchange Risk, Operational Risk etc.

UNIT 2

Measurement of Risks: Measurement of Interest Rate Risk and Market Rate Risk- Measurement of Credit Risk- Measurement of operational and Technology Risk- Measurement of Foreign Exchange and Sovereign Risk- Measurement of Liquidity Risk- Measurement of Off Balance Sheet Risks.

UNIT3

Management of Risks: Risk Management Tools- Interest Rate Risk Management- Market Risk Management- Credit Risk Management- Operational Risk Management- Foreign Exchange and Sovereign Risk Management- Liquidity Risk Management- Management of Capital Adequacy- Risk Reporting

UNIT 4

Regulatory and Other Issues in Risk Management: Regulatory Frame Work- Revised RBI Risk Management Norms to Banks- Organizational Structure for Market and Credit Risk- SEBI, NHB- Bank for International Settlement- BASEL Committee on Banking Supervision- BASEL Settlement I,II & III- Calculation of Minimum Capital Requirements.

UNIT 5

Important Concepts of Risk Management: Time Value of Money- Advance Bond Concepts- Calculation of VaR- Balck-Scholes Model- Moody's KMV Portfolio Manager- Probability Distribution and Fundamentals of Statistics- Derivative Products and its Markets- Margin and Mark-to-Market.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Dr. G. Kotreshwar: "Risk Management", Himalaya Publishing House, Delhi. 2012
2. Trieschmann, Hoyt, Sommer: "Risk Management and Insurance", Cengage Learning. 2005,
3. Dhanesh Kumar Khatri: "Derivatives and Risk Management", Mac Millan, 2012
4. Vivek, P.N. Asthana:"Financial Risk Management", Himalaya Publishing House, Delhi. 2012
5. Rene M. Stulz. "Risk Management & Derivatives" Cengage Learning. 2003.

FINANCE ELECTIVE 8

TAX MANAGEMENT

UNIT 1

Direct and Indirect Taxes: Income Tax Act 1961 – Basic concepts – Income – Agricultural Income – Residential Status – Income exemption from tax – Income from House Property – Computation of Salary Income – Income from Business and Profession – Capital Gain from other sources – computation of Total Income. Indirect Taxes – Excise Duty – Introduction – Nature – Basic Concepts – Types and Taxable Event for Excise Duty.

UNIT 2

CENVAT : Input Goods and Services for CENVAT – Capital Goods for CENVAT – Exempted Final Products / Output Services – Customs Duty – Introduction – Basic Concepts – Scope and Converge of Customs Duty – Nature of Customs Duty – Classification for Customs – Types of Custom Duties – Exemptions from Customs Duty – Valuation for Customs Duty.

UNIT 3

Introduction to Tax Planning: Nature of Tax – Essential components in levy of tax – Legal Principles of taxation laws – Five basic Rules of interpretation of statues – Law Lexicon and Legal Maxims – Concepts of Tax Avoidance, Tax Evasion – Tax Planning and Tax Management.

UNIT 4

Tax Management Decisions: Tax considerations - Management Decisions, such as make / buy-own/lease - export/local sale - Guidelines to Tax planning – Relief's – Concessions – Rebates – Deductions – Incentives (Payment of Advance Tax) – Filing of Returns – Refunds – Penalties for non-compliance.

UNIT 5

Multi National Taxation: Bilateral Tax Treaties- Transfer Pricing for Tax Planning – Uses of Inter Company Loans- Tax Intensives Organizational Setup of MNCs- Tax Reliefs and Rebates in India- Tax Credits- Tax Havens- Investment Decision on Tax Planning- Global Investment and Tax Incentives- Transfer Pricing Methods- Measures to Plug Tax Loopholes.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Vinod K.Singhania and Mounica singhnia, Corporate Tax Planning and business Management, Taxmann Publications.

2. Vinod K.Singhania and Kapil Singhania, Direct Taxes – Law and Practice, Taxmann Publications

3. R.N.Lakhotia, Corporate Tax Planning, vision publications.

4. V.A. Avadhani, “International Financial Managment” Himalaya Publishing House, 2009

5. PG Apte, “International Financial Management” Tata Mc Graw Hill, 2009.

MARKETING ELECTIVE 5

SERVICES MARKETING

UNIT 1

Introduction to Services Marketing: Scope and Definition- Services Marketing Environment- Definition- Goods and Services- Components of Service- Characteristics- Service Delivery as a System- Service Facility Design and Layout- HRM Issues- -Building Services Aspirations- Tracking Customer Behavior-.

UNIT 2

Key Dimensions of Services Marketing: Introduction- Service Environment- Service Blue Printing- Service Encounter- Customer Expectations- Demand- Supply Management- Service Quality- Service Quality Gap- Service Quality Audit-Delivering Quality Services- Communication Strategies- Bench Marking-TQM-Customer Satisfaction Measurement Techniques- MPQ-ROQ- Service Guarantees.

UNIT 3

Management of Services Marketing: Introduction- Marketing Mix- Developing a Package- Product Attractiveness- Components of Promotion Mix- Strategic Services Marketing- Service Target Segments- Positioning the Services- Creating and Maintaining Value Relationship- Market Leadership Strategies.

UNIT 4

Service Marketing Practices I: Marketing of Financial and Insurance Services- Major Characteristics- Technological Innovations- Regulatory Mechanism- Marketing of Hospitality, Travel and Tourism Products- Marketing for Travel and Tourism- Segmentation- Tourism Marketing Strategies- Yield Management- Services Delivery- Global Service Quality- Marketing of Educational, Software and other Professional Services.

UNIT 5

Service Marketing Practices II: Marketing of Health Care, Celluar and Entertainment Services- Health Care Marketing Strategy- Major Hospital Products- Cellular Promotion Mix- Entertainment Marketing Mix- Emerging Influence of Retailing and Shopping Malls- Internationalization of Services- Liberization of Services- Off shoring – ITES- Industry Structure- Business Models

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Dr. S. Shajahan: Services Marketing, Himalaya Publishing House, New Delhi 2009.
2. Rajendra Nargundkar: “Services Marketing”, Tata McGraw Hill, New Delhi, 2011.
3. S.M. Jha: Service Management and Marketing, Himalaya Publishing House, New Delhi,2011
4. C. Bhattacharjee: Services Marketing, Excel Books, New Delhi, 2010

MARKETING ELECTIVE 6

PROMOTIONAL AND DISTRIBUTION MANAGEMENT

UNIT 1

Introduction to Promotional Management: Sales Display and Sales Promotion- Sales Promotion Objectives- Types of Sales Displays- Factors Influencing Sales Promotion- Tools of Sales Promotion- Sales Promotion Strategies- Sales Promotion and Consumer Behavior- Consumers Price Perceptions- Perceived Risk and Attitudes- Types of Promotion.

UNIT 2

Introduction to Distribution Management: Physical Distribution Management- The Concepts of Total Distribution Costs and Cost Trade-offs- Customer Service Standards- Strategic Issues in Physical Distribution- Challenges and Opportunities- From Physical Distribution to Marketing Logistics- Major Logistics Functions

UNIT 3

Marketing Channels: Nature and Importance of Marketing Channels- Emergence of Marketing Channel Structures- Types of Marketing Channels- Direct Marketing Channels vs Indirect Marketing Channels- Problems in Distribution- Selection of Distribution Channels- Channel Decisions

UNIT 4

Channel Institutions and Designing Channel System: Wholesaling- Agent Wholesaling Middle Man- Patterns in Wholesaling- Wholesaler Marketing Decision- Changing Patterns- Channel Design Decisions- Channel Design Comparison Factors- Ideal Channel Structure- Types of Channels- Implementation and Integration of Channel Design.

UNIT 5

Ethical and Social Issues in Distribution Management: Business Ethics and Sales Management- Ethical Issues facing Sales Managers- Managing Sales Ethics- Modeling Ethical Behavior- Making Decisions on Ethical Problems- Building a Sales Ethics Programme- International Distribution- Challenges in Managing an International Distribution Strategy.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. K. Shridhara Bhat: "**Sales and Distribution Management**", Himalaya Publishing House, 2011.
2. Dr. Matin Khan: "**Sales and Distribution Management**", Excel Books, New Delhi, 2005

3. Pingali Venugopal: "**Sales and Distribution Managment**", Sage Publications, New Delhi,2008.
4. Dr. S. L. Gupta: "**Sales and Distribution Management**", Excel Books, 2010

MARKETING ELECTIVE 7

GLOBAL MARKETING MANAGEMENT

UNIT 1:

Introduction to Global Marketing: Scope and Significance of global Marketing, - Difference between global and domestic marketing – The growing attractiveness of developing country market – International orientations, Stages of internationalization, Driving and restraining forces of global markets, Participants in international marketing.

UNIT 2:

International marketing strategy: Entry strategies in Global markets – modes of entries in global markets – global market segmentation – international targeting – criteria for targeting, selecting a global target market – Global product positioning strategy. Business Customs in global Market – strategies for FDI and FIIs - Entry Strategies of Indian Firms

UNIT 3:

Global Product & Price management: International product mix – Managing Global Research and Development for product management– Product diffusion and adoption in global markets – International Product Life Cycle – Product and culture – Global brand leadership – : Environmental influences on Pricing Decisions – Grey Market goods – Transfer pricing – Global Pricing – Policy Alternatives – Constraints on global pricing

UNIT 4:

Global Marketing Channels and Promotion for global markets: channels – Innovations in global channels – Channel strategy for new market entry – Distribution Structures – Global Distribution Patterns - Challenges in Managing An Global Distribution Strategy – Selecting Foreign Country Market intermediaries - Global Advertising and branding - Export Policy Decisions of a firm - Export costing and pricing – EXIM policy of India.

UNIT 5:

Export procedures and documents: Preliminaries: inquiry and offer – confirmation of offer – export license – finance – production /procurement of goods – shipping space – packing and marketing – quality control and pre – shipment inspection – excise clearance – customs formalities – negotiation and documents – standardization and aligned pre-shipment documents – documents related to goods – documents related to shipments.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Francis Cherunilam: International marketing, 11th Edition, Himalaya Publication House,2010
2. Warren J Keegan: Global Marketing Management, 5th Edition, Prentice Hall of India Private Limited.

3. Philip R. Cateora, John L. Graham: International Marketing 11/e, Tata McGraw-Hill Co. Ltd., 2002.
4. R.Srinivasan: International Marketing, Prentice-Hall of India Pvt. Ltd., 2010
5. U.C Mathur: International Marketing Management, Sage Publications, New Delhi 2008
6. Kotabe, Peloso: International Marketing, Wiley India, New Delhi, 2020

MARKETING ELECTIVE 8

SUPPLY CHAIN MANAGEMENT

UNIT 1:

Introduction to Supply Chain Management: Definition – Types of Supply Chain Management- Objectives of Supply Chain Management- Analysis of Supply Chain Management and their Constituents- Supply Chain Activities- Supply Chain Organization- Managing Technical Challenges of Supply Chain.

UNIT 2:

Supply Chain Management: An Overview: Purchasing Issues in Supply Chain Management- Operations and Distribution issues in Supply Chain Management- Facility Location Decisions- Domestic and International Transportation Management- Process Management.

UNIT 3:

Customer Relationship Management: Introduction-Definition- Role of Supply Chain Management in CRM- Key Tools and components of CRM- Segmenting Customers- Predicting Customer Behavior- Personalizing Customer Communications- Customer Service Capabilities- Designing and Implementing Successful CRM.

UNIT 4:

Sustaining Competitive Advantage: Supply Chain Process Integration- Review and Establish Supply Chain Strategies- Developing Supply Chain Performance Measure and asses Internal Integration of Key Processes- Extend Process Integration to Second Tier Supply Chain Partners- Performance Measurement

UNIT 5:

International Supply Chain Management: Introduction of International SCM- International Logistics Infrastructure – Methods of entry into Foreign Markets- International Contracts- Terms and Trades or Incoterms- Terms of Payments- Currency of Payments and Managing Transaction Risk- International Commercial Documents.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Joel D. Wisner, G. Keong Leong, Keah-Choon Tan: Principles of Supply Chain Management, Cengage learning, New Delhi, 2009.

2. Sarika Kulkarni, Ashok Sharma: Supply Chain Management, Tata Mc Grawhill Education Private Limited, 2010.
3. David, Stewart: International Supply Chain Management, *Cengage* learning, New Delhi, 2007.
4. B. Raja Sekhar, GVRK Acharyulu: Logistics and Supply Chain Management, Excel Books, New Delhi, 2009
5. G. Raghuram, N. Rangaraj: Logistics and Supply Chain Management, Mac Millan Business Books, New Delhi 2000.

SYSTEMS ELECTIVE 5

BUSINESS INTELLIGENCE

UNIT-1

Introduction to Business Intelligence: The Business pressure-Responses and support model-Definition of BI- Architecture of BI- Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence-Value driven and Information use-Performance metrics and key performance indicators-horizontal use cases for BI.

UNIT-2

Data Ware Housing: Definitions and concepts-DW process an Innovation-Data Warehousing Implementation-Data warehousing Administration-Security Issues and future trends. Business Performance Management-Overview Strategic plan, monitor, performance measurement, BPM methodologies-BPM Techniques-Performance dashboard and scorecards

UNIT-3

Data Mining for Business Intelligence: Data mining concepts and definitions-Data mining applications - Artificial neural Networks for data mining - Text and web mining-Natural language processing-Text mining applications-Text mining process-tools-Web mining overview-Web content overview-Web structure mining-Web usage mining.

UNIT-4

Business Rules: The Value Preposition of Business Rules - Business rules approach-Business rule system - Sources of business rules and management approach.

UNIT -5

Business Intelligence Implementation: Business Intelligence and integration - Implementation - connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Amit Johri “Business Intelligence” Himalaya, 2012
2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012
3. Carlo Vercellis “Business Intelligence” Wiley Publications, 2012
4. Nina Godbole & Sunit Belapure “ Cyber Security” Wiley india 2012.
5. Jawadekar, MIS Text and Cases, TMH, 2012
6. Efraim Turban et al. “Business Intelligence” 2e, Pearson Education, 2012

SYSTEMS ELECTIVE 6

ENTERPRISE RESOURCE PLANNING

UNIT 1

Introduction to ERP: Overview of ERP – Introduction and Evaluation –advanced ERP-SCM and CRM systems and related technologies - ERP life cycle ERP implementation Life cycle-SDLC and ERP life cycle.

UNIT 2

ERP Implementation: reasons for ERP failure . pre – implementation Tasks – Implementation methodologies – Process definition – Dealing with employee resistance Training and Education – Project management and monitoring Success and failure factors of an ERP implementation.

UNIT 3

Post ERP implementation: Change Management – post implementation review, support, maintenance and security of ERP. Different business modules of an ERP package. ERP market place and market place dynamics

UNIT 4

ERP System Options and Selection Methods: Optimal Means of Developing an ERP, Measurement of Project Impact, IT Selection and Project Approval, ERP proposal Evaluation, Project Evaluation Techniques, Testing.

UNIT 5

ERP present and future: Turbo charge the ERP system- EAI - ERP. Internet and WWW-Future Directions and trends in ERP - Future Directions in ERP: New Markets, New Technologies, Faster Implementation Methodologies, New Business Segments, Trends in Security.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Singla: “Enterprise Resource Planning”, Cengage Learning, New Delhi, 2013
2. Alexleon: “Enterprise Resource Planning”, TMH, New Delhi, 2011
3. Mahadeo Jaiswal, Ganesh Vanapalli: “Enterprise Resource Planning”, MacMillon, New Delhi, 2013
4. N.Venkateswaran: “Enterprise Resource Planning”, SCITECH Publiscation, NewDelhi, 2009
5. S.Kesharwani, SBodduluri, M Ashok Kumar: “Enterprise Resource Planning”, Paramount Publishing House, New Delhi, 2012

SYSTEMS ELECTIVE 7

CYBER LAWS & SECURITY

UNIT 1

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT 2

Secure System Planning and administration: Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT 3

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.

UNIT 4

Information security: fundamentals-Employee responsibilities- information classification Information handling- Tools of information security- Information processing-secure program administration.

UNIT 5

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.

2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.

3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.

4. Thomas R Peltier, Justin Peltier and John blackley, "Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996

5. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag, 1997

SYSTEMS ELECTIVE 8

INFORMATION SYSTEMS AUDIT

UNIT 1

Overview of Information System Auditing: Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

UNIT 2

The Management Control Framework-I: Introduction, Evaluation the Planning Function, Leading Function and Controlling Function, Systems Development - Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT 3

The Management Control Framework-II: Security Management Controls, Operations Management Controls Quality assurance Management Controls- Case Studies.

UNIT 4

Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts.
Performance Management tools- Case Studies.

UNIT 5

Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency. Information Systems Audit and Management: Managing the Information Systems Audit Function,

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Ron Weber: “Information Systems Control and Audit”, Pearson Education,2013.
2. D P Dube: Information System Audit and Assurance, TMH, New Delhi,2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, KAKINADA: KAKINADA

MBA II SEMESTER SYLLABUS (R16 REGULATIONS)

FINANCIAL MANAGEMENT

UNIT 1

Financial Management: Concept - Nature and Scope - Evolution of financial Management - The new role in the contemporary scenario – Goals and objectives of financial Management - Firm's mission and objectives - Profit maximization Vs. Wealth maximization – Maximization Vs Satisfying - Major decisions of financial manager.

UNIT 2

Financing Decision: Sources of finance - Concept and financial effects of leverage – EBIT – EPS analysis. Cost of Capital: Weighted Average Cost of Capital– Theories of Capital Structure..

UNIT 3

Investment Decision: Concept of Time Value of money – Techniques of Time Value of Money – Nature and Significance of Investment Decision – Estimation of Cash flows – Capital Budgeting Process – Techniques of Investment Appraisal – Pay back period, Accounting Rate of Return, Time Value of Money – DCF Techniques- Net Present Value, Profitability Index and Internal Rate of Return.

UNIT-4

Dividend Decision: Meaning and Significance – Major forms of dividends – Theories of Dividends – Determinants of Dividend – Dividends Policy and Dividend valuation – Bones Shares –Stock Splits – Dividend policies of Indian Corporate.

UNIT-5

Liquidity Decision: Meaning - Classification and Significance of Working Capital – Components of Working Capital – Factors determining the Working Capital – Estimating Working Capital requirement – Cash Management Models – Cash Budgeting – Accounts Receivables –Credit Policies – Inventory Management.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. P.Vijaya Kumar, M.Madana Mohan, G. Syamala Rao:"**Financial Management",** Himalaya Publishing House, New Delhi,2013.
2. Rajiv Srivastava, Anil Misra: "**Financial Management**", Oxford University Press, New Delhi,2012

3. Brigham,E.F: "**Financial Management Theory and Practice**", Cengae Learning, New Delhi, 2013
4. Prasanna Chandra: "**Financial Management Theory and Practice**", Tata McGrawHill 2011.
5. I.M. Pandey: "**Financial Management",** Vikas Publishers, New Delhi, 2013.
6. RM Srivastava, Financial Management, Himalaya Publishing house, 4th edition.
7. Khan and Jain: Financial Management, Tata McGraw Hill, New Delhi,

HUMAN RESOURCE MANAGEMENT

UNIT 1

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department –aligning HR strategy with organizational strategy - HRM at global perspective-challenges – cross-cultural problems – emerging trends in HRM.

UNIT 2

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques – Training evaluation - retention - Job Analysis – job description and specifications - Management development - HRD concepts.

UNIT 3

Performance Appraisal: Importance – Methods – Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments - compensation mechanisms at international level.

UNIT 4

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- - Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms

UNIT 5

Managing Industrial Relations: Trade Unions - Employee Participation Schemes-Collective Bargaining–Grievances and disputes resolution mechanisms – Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. K Aswathappa: "***Human Resource and Personnel Management***", Tata McGraw Hill, New Delhi, 2013
2. N.Sambasiva Rao and Dr. Nirmal Kumar: "**Human Resource Management and Industrial Relations**", Himalaya Publishing House, Mumbai
3. Mathis, Jackson,Tripathy:"***Human Resource Management:Asouth-Asin Perspective***", Cengage Learning, New Delhi, 2013
4. Subba Rao P: "***Personnel and Human Resource Management-Text and Cases***", Himalaya Publications, Mumbai, 2013.
5. Madhurima Lall, Sakina Qasim Zasidi: "**Human Resource Management**", Excel Books, New Delhi, 2010

MARKETING MANAGEMENT

UNIT 1

Introduction to Marketing: Needs - Wants – Demands - Products - Exchange - Transactions - Concept of Market and Marketing and Marketing Mix - Product and Production Concept - Sales and Marketing Concept - Societal Marketing Concept - Indian Marketing Environment.

UNIT 2

Market Segmentation and Targeting: Identification of Market Segments - Consumer and Institutional/corporate Clientele - Segmenting Consumer Markets - Segmentation Basis – Evaluation and Selection of Target Markets – Developing and Communicating a Positioning Strategy.

UNIT 3

Pricing Strategy: Objectives of Pricing - Methods of Pricing - Selecting the Final price - Adopting price - Initiating the price cuts - Imitating price increases - Responding to Competitor's price changes.

UNIT 4

Marketing Communication: Communication Process – Communication Mix - Managing Advertising Sales Promotion - Public relations and Direct Marketing - Sales force - Objectives of Sales force - Structure and Size - Sales force Compensation.

UNIT 5

Marketing Organization and Control: Evolution of Marketing Department - Organizing the Marketing Department - , Marketing Implementation - Control of Marketing Performance - Annual Plan Control - Profitability Control - Efficiency Control - Strategic Control.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Lamb, Hair, Sharma: "**MKTG**" Cengage Learning , New Delhi, 2013
2. Phillip Kotler: "**Marketing Management** ", Pearson Publishers, New Delhi, 2013.
3. Rajan Sexena: "**Marketing Management**", Tata McGraw Hill, New Delhi, 2012.
4. R.Srinivasan: "**Case Studies in Marketing**", PHI Learning, New Delhi, 2012
5. Tapan K Pand: "**Marketing Management**", Excel Books, New Delhi, 2012
6. Paul Baines, Chris Fill, Kelly Page Adapted by Sinha K: "**Marketing**", Oxford University Press, Chenni, 2013.

PRODUCTION & OPERATIONS MANAGEMENT

UNIT 1

Introduction: Overview & Definition of Production and Operations Management- Nature and Scope of Production and Operations Management-Historical Evolution –Role & responsibilities of the production manager - Types of Manufacturing Processes and Product Design.

UNIT 2

Production Planning and Control: Stages in PPC – Gantt – PPC in Mass, Batch, and Job Order Manufacturing- Aggregate planning and Master Scheduling, MRP, CRP. Maintenance management & Industrial Safety. Plant Location & Layout Planning- Factors influencing location - types of layouts. Capacity Planning – Optimal Production Strategies: Scheduling and Sequencing of Operations. Work Design: Method Study and Work Measurement - Work Sampling.

UNIT 3

Managing of Work Environment:– Automation --Technology Management -Waste Management. Quality Assurance and Quality Circles – Statistical Quality Control –Control Charts for Variables- Average, Range and Control charts for Attributes. Acceptance Sampling Plans. Purchase functions and Procedure - Inventory control – Types of Inventory– Safety stock – Inventory Control Systems –JIT, VMI.

UNIT 4

Quality Improvement: Basic concepts of quality, dimensions of quality, Juran's quality trilogy, Deming's 14 principles, Quality improvement and cost reduction, ISO 9000-2000 clauses & coverage. Six Sigma, Productivity –factors affecting productivity, measurement & improvements in productivity - new product development and design - stages & techniques. Total Productive Maintenance (TPM).

UNIT 5

Stores Management: Objectives of Stores Management – Requirements for efficient. Management of Stores – safety stock Inventory Control - Different Systems of Inventory Control, Costs & Types of Inventory. – ABC, VED and FNSD analyses. Value Analysis– importance in cost reduction – concepts and procedures.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Panner Selvem: "**Production and Operation Management**", Prentice Hall of India, NewDelhi, 2012.
2. K.Aswathappa, K. Shridhara: "**Production & Operation Management**", Himalaya Publishing House, New Delhi, 2012
3. Ajay K Garg: "**Production and Operation Management**", TMH, New Delhi,2012

4. Deepak Kumar Battacharya: "**Production & Operation Management**", University Press, New Delhi, 2012
5. AlanMuhlemann, JohnOakland,jasti Katyayani: "**Production and Operation Management**", Pearson, New Delhi,2013

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BUSINESS RESEARCH METHODS

UNIT 1

Introduction : Nature and Importance of research, The role of business research, aims of social research, research process, pure research vs. applied research, qualitative research vs quantitative research, exploratory research, descriptive research and experimental research, ethical issues in business research. Research Process – Types of Research –Defining Research Problem – Formulation of Hypothesis – Testing of Hypothesis.

UNIT 2

Data Base: Discussion on primary data and secondary data, tools and techniques of collecting data. Methods of collecting data. Sampling design and sampling procedures. Random Vs. Non-random sampling techniques, determination of sample size and an appropriate sampling design. Designing of Questionnaire –Measurement and Scaling – Nominal Scale – Ordinal Scale – Interval Scale – Ratio Scale – Guttman Scale – Likert Scale – Schematic Differential Scale.

UNIT 3

Survey Research and data analysis: media used to communicate with respondents, personal interviews, telephone interviews, self-administered questionnaires, selection of an appropriate survey research design, the nature of field work, principles of good interviews and field work management. Editing – Coding – Classification of Data – Tables and Graphic Presentation – Preparation and Presentation of Research Report.

UNIT 4

Statistical Inference & quality control: Tests of Hypothesis, Introduction to Null hypothesis vs alternative hypothesis, parametric vs. non-parametric tests, procedure for testing of hypothesis, tests of significance for small samples, application, t-test, Chi Square test. Statistical Quality Control Upper quality charts p charts LCL UCL, BAR CHARTS. Attribute charts and industrial applications.

UNIT 5

Multivariate Analysis: Nature of multivariate analysis, classifying multivariate techniques, analysis of dependence, analysis of interdependence. Bivariate analysis-tests of differences-t test for comparing two means and z-test for comparing two proportions and ANOVA for complex experimental designs.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Navdeep and Guptha : "**Statistical Techniques & Research Methodology**", Kalyani Publishers
2. Willam G.Zikmund, Adhkari: "***Business Research Methods***", Cengage Learning, New Delhi, 2013.

3. S.Shajahan: "***Research Methods for management***", JAICO Publishing House, New Delhi, 2009.
4. UWE FLICK: "**Introducing *Research Methodology***", SAGE, New Delhi,2012.

5. Cooper R.Donald and Schindler S. Pamela: "***Business Research Methods***", 9/e, Tata MCGraw Hill, New Delhi.
6. M.V.Kulkarni: "**Research Methodology**" , Everest Publishing House, New Delhi, 2010.

ORGANIZATIONAL BEHAVIOR

UNIT 1:

Introduction - Nature and scope – linkages with other social sciences - Individual Roles and Organizational Goals - Perspectives of Human Behavior, Approach to Organizational behavior - models of organizational behavior.

UNIT 2:

Perceptual Management: Nature - Process – selection, organization and interpretation – Influencing factors **-**Motivation – Concepts - Needs and Motives and theories. Leadership and Motivating people - Leadership Theories. Attitudes and Values: formation - Types – Changes and Behavior Modification Techniques.

UNIT 3:

Personality Development: Nature - Stages, Determinants of Personality, - Johari Window - Transactional Analysis, Learning Processes - Theories, Creativity and Creative - Thinking. Leadership nature and skills. - Decision Making Process**:** Behavioral Dimensions, Groups and their formation - Group Dynamics, Informal Organizations, Group versus Individual Interaction.

UNIT 4

Inter-Personal Communication: Listening, Feedback, Collaborative Processes in Work Groups, Team Building, Team Decision Making, Conflict Resolution in Groups and Problem Solving Techniques.

UNIT 5

Organizations: Taxonomy, Elements of Structure, Determinants of Structure, Functional Aspects of Structure, Role Impingement, Stress in Organization. Principles and Design of Organizations, Organizational Culture, Power and Authority. . Organizational Development processes, Change – Resistance to Change.- Interventions, OD techniques and applications.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. K.Aswathappa: "**Organizational Behavior-Text, Cases and Games**", Himalaya Publishing House, New Delhi, 2008,
2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: "***Organizational Behavior***", Tata McGraw Hill Education, New Delhi, 2008.

3. Jerald Greenberg and Robert A Baron: "***Behavior in Organizations***", PHI Learning Private Limited, New Delhi, 2009.
4. Pareek Udai: "***Understanding Organizational Behavior***", Oxford University Press, New Delhi, 2007.
5. Jai B.P.Sinha: "***Culture and Organizational Behavior***", Sage Publication India Private Limted, New Delhi, 2008.

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DEPARTMENT OF MANGEMENT STUDIES

PROJECT REVIEW COMMITTEE-2017-18

Evaluation of Project Works

A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA. Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester. Every candidate shall work on projects approved by the PRC of the College. A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

The student should prepare a Project Report under the supervision of a guide from the faculty of management of the concerned college. However, the students who prepare Project Report in the area of systems can also work under the guidance of Faculty member from Computer Science Department. Three copies of Project dissertation certified by the Project supervisor shall be submitted to the College/School The project report shall be adjudicated by one examiner selected by the University. The College will submit a 5-member panel who are eminent in that field of study. The viva-voce examination of the project report shall be conducted by a board consisting of the External examiner, the Head of the Department and Supervisor. The Candidate should have to secure GradeA/Grade B/Grade C in Project viva-voce.

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

If the candidate fails to secure Grade A/Grade B/Grade C in project viva-voce, the candidate will retake the viva-voce examination after three months. If he fails to get Grade A/Grade B/Grade C at the second viva-voce examination, he will not be eligible for the award of the degree, unless the candidate is asked to revise and resubmit.

If the candidate fails to secure Grade A/Grade B/Grade C again, the project shall be summarily rejected.

Grade A: Excellent,

Grade B: Good,

Grade C: Satisfactory,

Grade D:Unsatisfactory

PROJECT REVIEW COMMITTEE

Chair person: Dr. K. Nageswara Rao

Head Of The Department: Dr. V. Vijay Durga Prasad

Senior Faculty members:

1. Mr. S.Manikanta,

2.Mr J.Naveen Gupta,

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DEPARTMENT OF MANGEMENT STUDIES

PROJECT REVIEW COMMITTEE-2016-17

Evaluation of Project Works

A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA. Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester. Every candidate shall work on projects approved by the PRC of the College. A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

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Grade B: Good,

Grade C: Satisfactory,

Grade D:Unsatisfactory

PROJECT REVIEW COMMITTEE

Chair person: Dr. K. Nageswara Rao

Head Of The Department: Dr. V. Vijay Durga Prasad

Senior Faculty members:

1. Mr. S.Manikanta,

2.Mr J.Naveen Gupta,

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DEPARTMENT OF MANGEMENT STUDIES

PROJECT REVIEW COMMITTEE-2015-16

Evaluation of Project Works

A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA. Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester. Every candidate shall work on projects approved by the PRC of the College. A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

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field of study. The viva-voce examination of the project report shall be conducted by a board consisting of the External examiner, the Head of the Department and Supervisor. The Candidate should have to secure GradeA/Grade B/Grade C in Project viva-voce.

Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

If the candidate fails to secure Grade A/Grade B/Grade C in project viva-voce, the candidate will retake the viva-voce examination after three months. If he fails to get Grade A/Grade B/Grade C at the second viva-voce examination, he will not be eligible for the award of the degree, unless the candidate is asked to revise and resubmit.

If the candidate fails to secure Grade A/Grade B/Grade C again, the project shall be summarily rejected.

Grade A: Excellent,

Grade B: Good,

Grade C: Satisfactory,

Grade D:Unsatisfactory

PROJECT REVIEW COMMITTEE

Chair person: Dr. K. Nageswara Rao

Head Of The Department: Dr. V. Vijay Durga Prasad

Senior Faculty members:

1. Mr. S.Manikanta,

2.Mr J.Naveen Gupta,

POTTI SRIRAMULU CHALAVADI MALLIKARJUNARAO
COLLEGE OF ENGINEERING & TECHNOLOGY
VIJAYAWADA - 520 001.
Approved by AICTE - ISO 9001:2015 Certified - Affiliated to JNTUK, Kakinada.

DEPARTMENT OF MANGEMENT STUDIES

PROJECT REVIEW COMMITTEE-2014-15

Evaluation of Project Works

A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA. Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester. Every candidate shall work on projects approved by the PRC of the College. A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

The student should prepare a Project Report under the supervision of a guide from the faculty of management of the concerned college. However, the students who prepare Project Report in the area of systems can also work under the guidance of Faculty member from Computer Science Department. Three copies of Project dissertation certified by the Project supervisor shall be submitted to the College/School The project report shall be adjudicated by one examiner selected by the University. The College will submit a 5-member panel who are eminent in that

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If the candidate fails to secure Grade A/Grade B/Grade C again, the project shall be summarily rejected.

Grade A: Excellent,

Grade B: Good,

Grade C: Satisfactory,

Grade D:Unsatisfactory

PROJECT REVIEW COMMITTEE

Chair person: Dr. K. Nageswara Rao

Head Of The Department: Dr. V. Vijay Durga Prasad

Senior Faculty members:

1. Mr. S.Manikanta,

2.Mr J.Naveen Gupta,

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DEPARTMENT OF MANGEMENT STUDIES

PROJECT REVIEW COMMITTEE-2013-14

Evaluation of Project Works

A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA. Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester. Every candidate shall work on projects approved by the PRC of the College. A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

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Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

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If the candidate fails to secure Grade A/Grade B/Grade C again, the project shall be summarily rejected.

Grade A: Excellent,

Grade B: Good,

Grade C: Satisfactory,

Grade D:Unsatisfactory

PROJECT REVIEW COMMITTEE

Chair person: Dr. K. Nageswara Rao

Head Of The Department: Dr. V. Vijay Durga Prasad

Senior Faculty members:

1. Mr. S.Manikanta,

2.Mr J.Naveen Gupta,

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DEPARTMENT OF MANGEMENT STUDIES

PROJECT REVIEW COMMITTEE-2012-13

Evaluation of Project Works

A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA. Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester. Every candidate shall work on projects approved by the PRC of the College. A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

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Head of the Department shall coordinate and make arrangements for the conduct of viva-voce examination.

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If the candidate fails to secure Grade A/Grade B/Grade C again, the project shall be summarily rejected.

Grade A: Excellent,

Grade B: Good,

Grade C: Satisfactory,

Grade D:Unsatisfactory

PROJECT REVIEW COMMITTEE

Chair person: Dr. K. Nageswara Rao

Head Of The Department: Dr. V. Vijay Durga Prasad

Senior Faculty members:

1. Mr. S.Manikanta,Associate Professor - S. Manikanta

2.Mr J.Naveen Gupta,Associate Professor

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DEPARTMENT OF MANGEMENT STUDIES

PROJECT REVIEW COMMITTEE-2018-19

Evaluation of Project Works

A Project Review Committee (PRC) of the college is to be constituted with Principal/Director as chairperson, heads of the departments, which are offering PG courses, and two other senior faculty members of the department offering MBA. Registration of Project work: A Candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses) up to II semester. Every candidate shall work on projects approved by the PRC of the College. A student has to undergo practical training for a period of 6 weeks in a Corporate Enterprise after the Second Semester/ Summer vacations In training period, the candidates should work on a specific problem related to the elective subject. At the end of practical training, the student should submit a certificate obtained from the organization.

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Grade D:Unsatisfactory

PROJECT REVIEW COMMITTEE

Chair person: Dr. K. Nageswara Rao

Head Of The Department: Dr. V. Vijay Durga Prasad

Senior Faculty members:

1. Mr. S.Manikanta, S. Manikanta

2.Mr J.Naveen Gupta, J. N. Gupta

Dr. V. VIJAY DURGA PRASAD
Professor and Head
Dept. of Management Studies
P.S. College of Engineering and Technology
VIJAYAWADA.

GOVERNMENT OF ANDHRA PRADESH

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

Andhra Pradesh :: Amaravathi

Globally Competetive

CURRICULUM (C-16)

For Polytechnic Diploma Courses
In Andhra Pradesh

DIPLOMA IN CIVIL ENGINEERING

Front Cover Page

Objective of the New Curriculum (C-16)

To make the students 'Globally Competetive & Employable' by learning industry relevant subjects & undergoing Industrial training

Suggestions from Industrialists have been incorporated in the Curriculum by organising **Industry Institute Interaction Meet.**

Highlights of the Curriculum (C-16)

- 6 months /1 year industrial training in all the Diploma Courses.
- 1 year industrial training in collaboration with BOAT (Board of Apprenticeship & Training (SR), Chennai).
- Virtual labs for ECE & Computer Branches & Strengthening of Skill Development Centers to provide industrial training to students.

Fundamentals of 'Internet of Things' (IoT) is included for all the Branches in the Subject "Industrial Management & Smart Technologies".

"Communication Skills" and "Life Skills" have been introduced as practical subjects for all the Branches.

Front Cover Page-Inside

"Computer Fundamentals Laboratory" is introduced for all the Branches in First year. AutoCAD specific to the Branch has been given emphasis in the Curriculum.

C Language, Programmable Logic Controllers (PLC), Microcontrollers, Solar Energy are introduced in Electrical Engineering Branch.

Mobile Communications, Consumer Electronics are introduced in Electronics and Communication Branch

CAD/ CAM, CNC Machines, Power Plant Engineering are introduced in Mechanical Engineering Branch.

OOPS through JAVA, Web Designing, Computer Hardware & Networking are introduced in Computer Engineering Branch.

Automobile Chassis and Body Engineering, Recent Trends In Automobile Engineering, Motor Transport Organization etc are introduced in Automobile Engineering Branch.

Back Cover Page-Inside

Journal (JPAP)

The Department of Technical Education, A.P. has a bi- annual 'Journal of Polytechnics of Andhra Pradesh' JPAP

CISCO

CISCO ACADEMIES IN POLYTECHNICS

- 70 Government Polytechnics chosen to have Cisco Academies
- Course Content of CISCO has been incorporated into the ECE and Computer Diploma Courses
- CISCO to train Staff of Polytechnics in two phases to enable them to run the courses effectively
- Students to get 'Certificate from CISCO' along with Diploma Certificate.

Back Cover Page

CURRICULUM-2016
(C-16)

FOR DIPLOMA COURSES IN ANDHRA PRADESH

PREAMBLE

The State Board of Technical Education and Training, Andhra Pradesh under the aegis of the Department of Technical Education, Andhra Pradesh generally reviews the Curricula once in every five years. However, recognizing the needs of the industries and enhancing the employability skills of Polytechnic students, the Government of Andhra Pradesh constituted a committee vide G.O.Rt.No:95 of Higher Education (TE) Dept dated: 29-4-2016 and G.O.Rt.No:98 of Higher Education (TE) Dept dated: 4-5-2016 for updation of polytechnic curriculum under the chairmanship of Sri. S. Balasubrahmanyam, IAS (Retd.,). The committee submitted a report on 31-5-2016 making certain recommendations and suggesting new initiatives to be incorporated in the curriculum. An Industry Institute Interaction Meet was organized with Industry experts and subject experts on 26-12-2016 and the suggestions from Industrialists have also been incorporated in the curriculum. The new Curricula for the different diploma courses have been designed with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh, besides reviewed by Expert Committee constituted with eminent academicians.

The primary objective of the curricular change is to produce best technicians in the country by correlating growing needs of the industries with the academic input.

The revised New Curriculum i.e., Curriculum–2016 (C-16) is approved by BoG of SBTET for its implementation with effect from 2016-17.

Salient Features:

1. Duration of course is either 3 years / 3½ years duration of Regular Academic Instruction.
2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. 6 Months/ 1 year Industrial Training is introduced for all the Diploma courses.

4. Fundamentals of Internet of Things (IOT) is introduced for all the Diploma courses in the subject.
5. Modern subjects relevant to the industry are introduced in all the Diploma courses.
6. CISCO course content has been incorporated into the ECE and CME courses to get certification from CISCO along with Diploma.
7. The policy decisions taken at the State and Central level with regard to environmental science are implemented by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.
8. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the Industries, emphasis is given for learning and acquiring listening, speaking, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are introduced for all the branches.
9. Modern topics relevant to the needs of the industry and global scenario suitable to be taught at Diploma level are also incorporated in the curriculum.
10. AutoCAD specific to the branch has been given more emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
11. Every student is exposed to the computer lab at the 1st year itself in order to familiarize himself with skills required for keyboard/mouse operation, internet usage and e-mailing.
12. Upon reviewing the existing C-14 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In the revised C-16 curriculum, more emphasis is given to the practical content of Laboratories and Workshops, thus strengthening the practical skills.
13. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based.
14. Curricula of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available at the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to conform to the field requirements of industry.
15. The Members of the working group are grateful to Sri G.S. Panda Das, I.A.S., Special Commissioner of Technical Education & Chairman of SBTET, AP. and Sri. Adityanath Das, I.A.S., Principal Secretary of Higher Education for their guidance and valuable inputs in revising, modifying and updating the curriculum.
16. The Members acknowledge with thanks the cooperation and guidance provided by Sri. A.Nirmal Kumar Priya, Secretary, SBTET, Andhra Pradesh and other officials of Directorate of Technical Education and the State Board of Technical Education, Andhra Pradesh, experts from industry, academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

RULES AND REGULATIONS

1 DURATION AND PATTERN OF THE COURSES

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of academic instruction.

All the Diploma courses are run on year wise pattern in the first year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in BM course, the training will be in the seventh semester. Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.

2 PROCEDURE FOR ADMISSION INTO THE DIPLOMA COURSES:

Selection of candidates is governed by the Rules and regulations laid down in this regard from time to time.

a) Candidates who wish to seek admission in any of the Diploma courses will have to appear for Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).

b) The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of making application to the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission

c) Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.

d) For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.
1). D.H.M.C.T. 2).D. Pharmacy

3 MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be English.

4 PERMANENT IDENTIFICATION NUMBER (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., A Permanent Identification Number (PIN) will be allotted to each admitted candidate to maintain academic records.

5 NUMBER OF WORKING DAYS PER SEMESTER / YEAR:

a). The Academic year for all the Courses shall be in accordance with the Academic Calendar.

b). The Working days in a week shall be from Monday to Saturday

c). There shall be 7 periods of 50 minutes duration on all working days.

d). The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to cover the syllabus.

6 ELIGIBILITY OF ATTENDANCE TO APPEAR FOR THE END EXAMINATION

a). A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.

b). Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.

c). A stipulated fee shall be payable towards condonation for shortage of attendance.

d). Candidates having less than 65% attendance shall be detained.

e). Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered next.

7 READMISSION

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

1. a) Within 15 days after commencement of class work in any semester (Except Industrial Training).

   b) For Industrial Training: before commencement of the Industrial training.

2. Within 30 days after commencement of class works in any year (including D. Pharmacy course or first year course in Engineering and Non Engineering Diploma streams).

   Otherwise such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.

   The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work, after readmission is granted.

8 SCHEME OF EXAMINATION

a) First Year

THEORY EXAMINATION: Each Subject carries 80% marks with examination of 3 hours duration, along with 20% marks for internal evaluation. (Sessional marks). However, there are no minimum marks prescribed for sessionals.

PRACTICAL EXAMINATION: There shall be 40% Marks for regular practical work done, i.e. sessional marks for each practical subject with an end examination of 3 hours duration carrying 60% marks. However, there are no minimum marks prescribed for sessionals.

b) III, IV, V, VI and VII Semesters:

THEORY EXAMINATION: Each subject carries usually 80 marks and 30 marks in respect of specified subjects of 3hours duration, along with 20 marks for internal evaluation (sessional marks) respectively.

PRACTICAL EXAMINATION: Each subject carry 60/30 marks of 3hours duration 40/20 sessional marks.

9 INTERNAL ASSESSMENT SCHEME

a) Theory Subjects: Theory Subjects carry 20% sessional marks, Internal examinations will be conducted for awarding sessional marks on the dates specified. **Three unit tests will be conducted for I year students and two Unit Tests for semesters.** Average of marks obtained in all the prescribed tests will be considered for awarding the sessional marks.

b) Practical Subjects: Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40% marks in each practical subject. Allotment of marks should be discrete taking into consideration of the students' skills, accuracy, recording and performance of the task assigned to him / her. Each student has to write a record / log book for assessment purpose. In the subject of Drawing, which is also considered as a practical paper, the same rules hold good. Drawing exercises are to be filed in seriatum.

c) Internal assessment in Labs / workshops / Survey field work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Lecturer / Senior Lecturer / Workshop superintendent as the case may be.

d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of Section preferably choosing a qualified person from any local Industry/ nearby Government Polytechnic/ Local Government Organization. Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.

e) Question Paper for Practicals: Question paper should cover all the experiments / exercise prescribed.

f) Records pertaining to internal assessment marks of both theory and practical subjects are to be maintained for official inspection.

g) **In case of Diploma courses *having* Industrial Training**, the training assessment shall be done and the marks are to be awarded in the following manner.

Industrial assessment	:	200 marks (in two spells of 100 marks each)
Maintenance of log book	:	30 marks
Record Work	:	30 marks
Seminar / viva-voce	:	40 marks

TOTAL	:	300 marks

The assessment at the institution level (Seminar/Viva-voce)shall be done by three members, viz., Internal Faculty member, External Examiner and Head of Section and be averaged.

10 MINIMUM PASS MARKS

THEORY EXAMINATION:

For passing a theory subject, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

PRACTICAL EXAMINATION:

For passing a practical subject, a candidate has to secure a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical end examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand subjects of D.C.C.P course.

11. PROVISION FOR IMPROVEMENT

1. Improvement is allowed only after he / she has completed all the subjects from First Year to Final semester of the Diploma.
2. Improvement is allowed in any 4 (Four) subjects of the Diploma.
3. The student can avail of this improvement chance **ONLY ONCE**, that too within the succeeding two examinations after the completion of Diploma. However, the duration including Improvement examination shall not exceed FIVE years from the year of first admission.
4. No improvement is allowed in Practical / Lab subjects or Project work or Industrial Training assessment. However, improvement in drawing subject(s) is allowed.
5. If improvement is not achieved, the marks obtained in previous Examinations hold good.

6. Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.

7. Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.

8. All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued, else the submitted originals will be returned.

12. RULES OF PROMOTION FROM 1ST YEAR TO 3,^{rd,} 4,th 5th ,6th and 7th SEMESTERS:

a) For Diploma Courses of 3 Years duration

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

i) Puts the required percentage of attendance in the 4th semester

ii) Should not have failed in more than Four backlog subjects of 1st year

<u>For IVC & ITI Lateral Entry Students:</u>

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

iv) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she

i) Puts the required percentage of attendance in the 5th semester

ii) Should get eligibility to appear for 4th Semester examination.

For IVC& ITI Lateral Entry students:

i) Puts the required percentage of attendance in the 5th semester
ii) Should not have failed in more than Four backlog subjects of 3rd Semester

v) A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pay the examination fee. A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

A candidate is eligible to appear for 6th semester Industrial Training assessment (Seminar/Viva-voce)

i) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training

ii) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training.
ii) should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. The record of internal assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

b) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT):

1. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.
2. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.
3. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate,

who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester exam if he/she

i) Puts the required percentage of attendance in the 4th semester
ii) Should not have failed in more than Four backlog subjects of 1st year.

For IVC & ITI Lateral Entry students:

(i) Puts the required percentage of attendance in the 4th semester

4. A candidate shall be promoted to 5th semester industrial training provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.
5. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of attendance, which in this case ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.
6. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 7th semester.
7. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.

A candidate is eligible to appear for 7th semester examination if he/she

i) Puts the required percentage of attendance in the 7th semester
ii) Should get eligibility to appear for 4th semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance in the 7th semester
ii) Should not have failed more than four backlog subjects of 3rd Semester

OTHER DETAILS

a) In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.

b) The I spell of Industrial training shall commence 10 days after the completion of the last theory examination of 4th Semester.

c) The Second spell of Industrial training shall commence within 10 days after the completion of I spell of Industrial training.

c) For Diploma Courses of 3 ½ Years duration (BM):

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

1. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

2. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

3. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

   A candidate is eligible to appear for the 4th semester examination if he/she

   i) Puts the required percentage of attendance in the 4th semester

   ii) Should not have failed in more than Four backlog subjects of 1st year

<u>For IVC & ITI Lateral Entry Students:</u>

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

4. A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

   A candidate is eligible to appear for the 5th semester exam if he/she

   i) Puts the required percentage of attendance in the 5 th semester

   ii) Should get eligibility to appear for 4th Semester examination.

For IVC & ITI Lateral Entry students:

iii) Puts the required percentage of attendance in the5th semester
iv) Should not have failed in more than Four backlog subjects of 3rd Semester

5. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.

A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

A candidate is eligible to appear for 6th semester examination

i) Puts the required percentage of attendance in 6th semester and

ii) should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance in 6th semester.
ii) should get eligibility to appear for 5th Semester Examination.

6. A candidate shall be promoted to 7th semester provided he/she puts the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment

(Seminar/Viva-voce) if he/she

i) Puts the required percentage of attendance, ie., 90% in 7th semester Industrial Training
ii) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance, ie., 90% in 7th semester Industrial Training.
ii) Should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. However, the record of internal Assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

OTHER DETAILS

a) In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.

b) The Industrial training shall commence 10 days after the completion of the last theory examination of 6th Semester.

13. STUDENTS PERFORMANCE EVALUATION

Successful candidates shall be awarded the Diploma under the following divisions of pass.

1. First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.

2. First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.

3. Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.

   The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.

   In respect IVC & ITI Lateral Entry candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters of study shall be taken into consideration for determining the overall percentage of marks secured by the candidates for award of class/division.

4. Second Class shall be awarded to all students, who fail to complete the Diploma in the regular 3 years/ 3 ½ years and four subsequent examinations, from the year of first admission.

14. EXAMINATION FEE SCHEDULE:

The examination fee should be as per the notification issued by State Board of Technical Education and Training from time to time.

15. STRUCTURE OF END EXAMINATION QUESTION PAPER:

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular subject be considered Examination paper is of 3/6/9 hours duration.

a) Each theory paper consists of Section ‘A’ and Section ‘B’. Section ‘A’ contains 10 short answer questions. All questions are to be answered and each carries 3 marks Max. Marks: 10 x 3 = 30.
   Section B contains 8 essay type questions including Numerical questions, out of which 5 questions each carrying 10 marks are to be answered.

Max.Marks: 5 x 10 = 50.

Total Maximum Marks: 80.

b) For Engineering Drawing Subject (107) consist of section 'A' and section 'B'. Section 'A' contains four (4) questions. All questions in section 'A' are to be answered and each carries 5 marks. Max. Marks: 4 x 5=20. Section 'B' contains six (6) questions. Out of which four (4) questions to be answered and each question carries 10 Marks. Max. Marks 4 x 10 = 40.

c) Practical Examinations
For Workshop practice and Laboratory Examinations, Each student has to pick up a question paper distributed by Lottery System.

Max. Marks for an experiment / exercise : 50%

Max. Marks for VIVA-VOCE : 10%

Total : 60% (of total marks for the subject)

In case of practical examinations with 50 marks, the marks will be worked out basing on the above ratio.

In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

16. ISSUE OF MEMORONDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo.

17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA COURSES:

Maximum period for completion of the diploma courses is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

18. ELIGIBILITY FOR AWARD OF DIPLOMA

A candidate is eligible for award of Diploma Certificate if he / she fulfils the

following academic regulations.

i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.

ii. He / she has completed all the subjects.

Students who fail to fulfill all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

For IVC & ITI Lateral Entry students:

i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 academic years.

ii. He / she has completed all the subjects.

Students who fail to fulfill all the academic requirements for the award of the Diploma within 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

1. A candidate desirous of applying for Photo copy of valued answer script/ scripts should apply within prescribed date from the date of the declaration of the result.
2. Photo copies of valued answer scripts will be issued to all theory subjects and Drawing subject(s).
3. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.
4. No application can be entertained from third parties.

B) FOR RE-COUNTING(RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

1. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.
2. Re-verification of valued answer script shall be done for all theory subjects and Drawing subject(s).
3. The Re-verification committee constituted by the Secretary, SBTETAP with subject experts shall re-verify the answer scripts.

I) RE-COUNTING

The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

2) RE-VERIFICATION

(i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.

(ii) Initially single member shall carry out the re-verification.

(iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level ie., for 2-Tier evaluation.

(iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.

(v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:

a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.

b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.

c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.

(vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.

(viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

4. No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

20. MAL PRACTICE CASES:

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

21. DISCREPANCIES/ PLEAS:

Any Discrepancy /Pleas regarding results etc., shall be represented to the SBTETAP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

22. ISSUE OF DUPLICATE DIPLOMA

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a

duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed before a First Class Magistrate (Judicial) and *non-traceable certificate* from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training, A.P.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET from time to time.

23. ISSUE OF MIGRATION CERTIFICATE AND TRANSCRIPTS:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

24. GENERAL

i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.

ii. All legal matters pertaining to the State Board of Technical Education and Training are within the jurisdiction of Vijayawada.

iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P is final.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

FIRST YEAR

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theor	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-101	English-I	3	-	90	3	20	80	100
C-102	Engineering Mathematics – I	5	-	150	3	20	80	100
C-103	Engineering Physics	4	-	120	3	20	80	100
C-104	Engineering Chemistry and Environmental studies	4	-	120	3	20	80	100
C-105	Surveying – 1	5	-	150	3	20	80	100
C-106	Engineering Mechanics	5	-	150	3	20	80	100
PRACTICAL SUBJECTS								
C-107	Engineering Drawing	-	6	180	3	40	60	100
C-108	Surveying - I Practice & Plotting	-	4	120	3	40	60	100
C-109	Physics Laboratory	-	3	90	3	20	30	50
C-110	Chemistry Laboratory	-			3	20	30	50
C-111	Computer Fundamentals laboratory	-	3	90	3	40	60	100
	Total	**26**	**16**	**1260**	**-**	**280**	**720**	**1000**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2016
III SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-301	Engineering Mathematics –II	5	-	75	3	20	80	100
C-302	Strength of Materials & Theory of Structures	6	-	90	3	20	80	100
C-303	Hydraulics	6	-	90	3	20	80	100
C-304	Surveying-II	5	-	75	3	20	80	100
C-305	Construction Materials	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-306	Civil Engineering Drawing-I	-	6	90	3	40	60	100
C-307	Material Testing Laboratory	-	3	45	3	40	60	100
C-308	Surveying - II Practice & Plotting	-	4	60	3	40	60	100
C-309	Hydraulics Laboratory	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

IV SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-401	Reinforced Concrete Structures	6	-	90	3	20	80	100
C-402	Irrigation Engineering	4	-	60	3	20	80	100
C-403	Quantity Surveying	6	-	90	3	20	80	100
C-404	Transportation Engineering	5	-	75	3	20	80	100
C-405	Construction Practice	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-406	Civil Engineering Drawing-II	-	4	60	3	40	60	100
C-407	CAD Practice - I	-	6	90	3	40	60	100
C-408	Communication skills	-	3	45	3	40	60	100
C-409	Building Construction Practices	-	4	60	3	40	60	100
	Total	**25**	**17**	**630**	**-**	**260**	**640**	**900**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

V Semester

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods	Scheme Of Examinations			
		Theory	Practicals	Per Semester	Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-501	Steel Structures	5	-	75	3	20	80	100
C-502	Construction Technology and Project Management	5	-	75	3	20	80	100
C-503	Environmental Engineering	6	-	90	3	20	80	100
C-504	Geotechnical Engineering	4	-	60	3	20	80	100
C-505	Advanced Civil Engineering Technologies	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
C-506	Civil Engineering Drawing-III	-	4	60	3	40	60	100
C-507	CAD Practice - II	-	6	90	3	40	60	100
C-508	Life skills	-	3	45	3	40	60	100
C-509	Civil Engineering Work shop	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

C-601 INDUSTRIAL TRAINING
(Practical Training)

VI SEMESTER

Scheme of evaluation:

S.No	Subject	Duration	Items	Max Marks	Remarks
1	Practical Training in the Industry	6 Months	1.First Assessment (at the end of 3rd month)	100	
			2. Second Assessment (at the end of 6th month)	100	
			3.Training report i) Log Book ii) Report	30 30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks are 50%.A candidate failing to secure the minimum marks should complete it at his own expenses.

During Industrial training the candidate shall put in a minimum of 90%attendence.

FIRST YEAR

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

FIRST YEAR

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theor	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-101	English	3	-	90	3	20	80	100
C-102	Engineering Mathematics – I	5	-	150	3	20	80	100
C-103	Engineering Physics	4	-	120	3	20	80	100
C-104	Engineering Chemistry and Environmental studies	4	-	120	3	20	80	100
C-105	Surveying – 1	5	-	150	3	20	80	100
C-106	Engineering Mechanics	5	-	150	3	20	80	100
PRACTICAL SUBJECTS								
C-107	Engineering Drawing	-	6	180	3	40	60	100
C-108	Surveying - I Practice & Plotting	-	4	120	3	40	60	100
C-109	Physics Laboratory	-	3	90	3	20	30	50
C-110	Chemistry Laboratory	-			3	20	30	50
C-111	Computer Fundamentals laboratory	-	3	90	3	40	60	100
	Total	**26**	**16**	**1260**	**-**	**280**	**720**	**1000**

C-16-COMMON-101- ENGLISH-I
(Common to all Branches)

Subject Title : ENGLISH-I

Subject Code : Common - 101

Periods per Week : 3

Periods per Year : 90

Time Schedule& Weightage

Sl No	Major Topics	Titles of the Lessons	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary& Need for English	Lessons 1,2& Regular and essential vocabulary	5	13	1	1
2	Grammar	Lessons 11,12 & 19 to 26	30	31	7	1
3	Reading	Lessons 13 To 18	10	10	-	1
4	Writing	Lessons 27 To 40	30	40	-	4
5	English in Action	Lessons 3 To 10	15	16	2	1
		Total	90	110	10	08

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-16 Curriculum the focus is on the special needs of English for technicians.

. This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing reports, giving instructions and interpreting graphics/data is of

great importance. Therefore the curriculum C-16 focuses on improving communicative abilities equipping the students to become industry- ready and employable.

On completion of this course the student will be able to:

1.0 Build vocabulary in the direction of future needs
2.0 Learn various grammatical structures
3.0 Read and comprehend English and understand the details and draw inferences
4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs

1.1 Locate words, learn spellings, understand meanings
1.2 Pronounce words intelligibly
1.3 Find synonyms and antonyms
1.4 Use affixation
1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures

2.1 Identify and use nouns
2.2 Identify and use pronouns
2.3 Use the present tense
2.4 Use the past tense
2.5 Use the future tense
2.6 Identify and use adjectives
2.7 Identify and use adverbs
2.8 Use prepositions
2.9 Use linkers
2.10 State basic sentence structures
2.11 Construct different types of sentences
2.12 Frame questions to elicit information
2.13 Frame questions for confirmation
2.14 Use active voice
2.15 Use passive voice
2.16 Use direct speech
2.17 Use indirect speech
2.18 Identify and correct errors

3.0 Read and comprehend English

3.1 Identify the main ideas
3.2 Identify the specific details
3.3 Draw inferences
3.4 Give contextual meanings of the words
3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)

4.1 Identify components of a good paragraph
4.2 Write types of paragraphs
4.3 Distinguish between formal and informal letters
4.4 Write personal letters
4.5 Write leave letters
4.6 Write official letters
4.7 Write letters of complaints
4.8 Prepare a resume
4.9 Write a cover letter
4.10 Write short messages

4.11 Report incidents
4.12 Report experiments
4.13 Report Industrial visits
4.14 Write work done statements
4.15 Write maintenance reports
4.16 Make notes using Cue method and Mapping method
4.17 Summarize Paragraphs
4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

Practice spoken communication suited to various situations.

4.19 Use appropriate expressions to greet and take leave
4.20 Use proper expressions to make requests
4.21 Use apt expressions for asking and giving directions
4.22 Use suitable expressions to seek and offer suggestions
4.23 Use suitable expressions to state intentions
4.24 Use suitable expressions to state feelings
4.25 Use appropriate expressions to state agreement and disagreement
4.26 Use proper expressions to make complaints
4.27 Use suitable expressions to express obligations

Course Material

The textbook prepared by the faculty of English of Polytechnics in AP.

Reference Books

1. Essential English Grammar (Intermediate Level) Raymond Murphy
2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary) Santanu Sinha Chaudhuri
3. Grammar Builder (Entire Series) Oxford University Press
4. High School English Grammar (Revised Edition) Wren and Martin
5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill) John Langan, Paul Langan
6. Word Power Made Easy Norman Lewis
7. Spoken English Shashi Kumar and Dhamija

: **Engineering Mathematics - I**

(Common to all Branches)

Subject Title : Engineering Mathematics - I

Subject Code : Common - 102

Periods per Week : 5

Periods per Year : 150

Time Schedule

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
	Unit - I : Algebra	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
1	Logarithms	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	1/2
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0
	Unit III : Co-ordinate Geometry									
13	Straight Lines	5	3	6	1	1	0	0	0	0

14	Circle	4	2	5	0	0	0	0	1/2	0
15	Conic Sections	4	3	5	0	0	0	0	1/2	0
	Unit – IV : Differential Calculus									
16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
S. No	**Major Topic**	**No of Periods**		**Weightage of Marks**	**Short Type**			**Essay Type**		
	Unit - V : Applications of Differentiation	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
	Total	92	58	110	6	4	0	2	2 1/2	3 1/2
				Marks	18	12	0	20	25	35

R: Remembering type 38 marks
U: Understanding type 37 marks
App: Application type 35 marks

ENGINEERING MATHEMATICS – I

COMMON TO ALL BRANCHES – 102

Objectives

Upon completion of the course the student shall be able to:

UNIT – I

Algebra

1.0 Use Logarithms in engineering calculations

1.1 Define logarithm and list its properties.

1.2 Distinguish natural logarithms and common logarithms.

1.3 Explain the meaning of e and exponential function.

1.4 State logarithm as a function and its graphical representation.

1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

2.1 Define the following fractions of polynomials:

1. Rational,
2. Proper and
3. Improper

2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \dfrac{f(x)}{(x+a)(x+b)(x+c)}$ $\qquad ii)\quad \dfrac{f(x)}{(x+a)^2(x+b)(x+c)}$

$iii)\quad \dfrac{f(x)}{(x^2+a)(x+b)}$ $\qquad iv)\quad \dfrac{f(x)}{(x+a)(x^2+b)^2}$

3.0 Use Matrices for solving engineering problems

3.1 Define a matrix and order of a matrix.

3.2 State various types of matrices with examples (upto 3rd order square matrices).

3.3 Compute sum, scalar multiplication and product of matrices.

3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.

3.5 Define the transpose of a matrix and write its properties.

3.6 Define symmetric and skew-symmetric matrices.

3.7 Resolve a square matrix into a sum of symmetric and skew- symmetric matrices with examples in all cases.

3.8 Define minor, co-factor of an element of 2X2 and 3x3 square matrices with examples.

3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.

3.10 Distinguish singular and non-singular matrices.

3.11 State properties of determinants with simple examples.

3.12 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.

3.13 Compute adjoint and multiplicative inverse of a square matrix.

3.14 Representation of system of linear equations (2 variables in 2 equations and 3 variables in 3 equations) in matrix form.

3.15 Solve system of linear equations using Cramer's rule.

3.16 Solve system of linear equations by matrix inversion method

3.17 State elementary row operations.

3.18 Solve a system of linear equations by Gauss- Jordan method

UNIT – II

Trigonometry :

4.0 Understand Trigonometric Ratios

4.1 Define trigonometric ratios of any angle.

4.2 List the values of trigonometric ratios at specified values.

4.3 Draw graphs of trigonometric functions

4.4 Explain periodicity of trigonometric functions.

5.0 Solve simple problems on Compound Angles

5.1 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B)

5.2 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

5.3 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.,

5.4 Solve simple problems on compound angles.

6.0 Solve problems using the formulae for Multiple and Sub- multiple Angles

6.1 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.

6.2 Derive useful allied formulas like $\sin A = (1 - \cos 2A)/2$ etc.,

6.3 Solve simple problems using the above formulae

7.0 Apply Transformations for solving the problems in Trigonometry

7.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.

8.0 Use Inverse Trigonometric Functions for solving engineering problems

8.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

8.2 Define inverses of six trigonometric functions along with their domains and ranges.

8.3 Derive relations between inverse trigonometric functions so that given A= $\sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.

8.4 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x+\cos^{-1}x = \frac{\pi}{2}$ etc.

8.5 Derive formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right),\ where\ x \geq 0, y \geq 0, xy < 1$ etc., and solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

9.1 Explain what is meant by solutions of trigonometric equations and find the general solutions of sin x=k, cos x =k and tan x=k with appropriate examples.

9.2 Solve models of the type a $\sin^2$ x + b sin x +c=0, a cos x + b sin x=c etc., and problems using simple transformations.

10.0 Appreciate Properties of triangles and their solutions

10.1 State sine rule, cosine rule, tangent rule and projection rule.

10.2 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter and sides a, b, c .

10.3 List various formulae for the area of a triangle.

10.4 Solve problems using the above formulae.

10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

11.1 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.

11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

12.1 Define complex number, its modulus , conjugate and list their properties.

12.2 Define the operations on complex numbers with examples.

12.3 Define amplitude of a complex number

12.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.

12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT - III

Coordinate Geometry

13.0 Solve the problems on Straight lines

13.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form

13.2 Solve simple problems on the above forms

13.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

14.0 Solve the problems on Circles

14.1 Define locus of a point – circle and its equation.

14.2 Find the equation of a circle given

(i) Center and radius

(ii) Two ends of a diameter

(iii) Centre and a point on the circumference

(iv) Three non collinear points

14.3 Write the general equation of a circle and find the centre and radius.

15.0 Appreciate the properties of Conics in engineering applications

15.1 Define a conic section.

15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.

15.3 Find the equation of a conic when focus, directrix and eccentricity are given

15.4 Describe the properties of Parabola, Ellipse and Hyperbola in standard form.

UNIT - IV

Differential Calculus

16.0 Use the concepts of Limit and Continuity for solving the problems

16.1 Explain the concept of limit and meaning of $\lim_{x \to a} f(x) = l$ and state the properties of limits.

16.2 Mention the Standard limits $\lim_{x \to a} \frac{x^n - a^n}{x - a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to 0} \frac{\tan x}{x}$, $\lim_{x \to 0} \frac{a^x - 1}{x}$, $\lim_{x \to 0} \frac{e^x - 1}{x}$, $\lim_{x \to 0} (1 + x)^{\frac{1}{x}}$, $\lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x$ (All without proof).

16.3 Solve the problems using the above standard limits

16.4 Evaluate the limits of the type $\lim_{x \to l} \frac{a x^2 + b x + c}{\alpha x^2 + \beta x + \gamma}$ and $\lim_{x \to \infty} \frac{f(x)}{g(x)}$

16.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

17.0 Appreciate Differentiation and its meaning in engineering situations

17.1 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

17.2 State the significance of derivative in scientific and engineering applications.

17.3 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

17.4 Find the derivatives of simple functions from the first principle .

17.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

17.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

(i) $\sqrt{t^2 + \frac{2}{t}}$ **(ii)** $x^2 \sin 2x$ **(iii)** $\frac{x}{\sqrt{x^2 + 1}}$ **(iv)** $\log(\sin(\cos x))$.

17.7 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

17.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

17.9 Find the derivatives of hyperbolic functions.

17.10 Explain the procedures for finding the derivatives of implicit function with examples.

17.11 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.

17.12 Explain the concept of finding the higher order derivatives of second and third order with examples.

17.13 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.

17.14 Explain the definition of Homogenous function of degree n

17.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT - V

Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

18.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.

18.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

18.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x).

18.4 Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

19.0 Understand the Physical Applications of Derivatives

19.1 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

19.2 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

20.0 Use Derivatives to find extreme values of functions

20.1 Define the concept of increasing and decreasing functions.

20.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

20.3 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima.

20.4 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

21.0 Use Derivatives to find Errors and Approximations

21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

COURSE CONTENT

Unit-I

Algebra

1. Logarithms :

   Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions :

   Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

$$i)\quad \frac{f(x)}{(x+a)(x+b)(x+c)} \qquad ii)\quad \frac{f(x)}{(x+a)^2(x+b)(x+c)}$$

$$iii)\quad \frac{f(x)}{(x^2+a)(x+b)} \qquad iv)\quad \frac{f(x)}{(x+a)(x^2+b)^2}$$

Matrices:

3. Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 2 or 3 variables-Solutions by Cramer's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry :

4. Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. Compound angles: Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.
6. Multiple and sub multiple angles: trigonometric ratios of multiple angles 2A,3A and submultiple angle A/2 with problems.
7. Transformations of products into sums or differences and vice versa simple problems
8. Inverse trigonometric functions : definition, domains and ranges-basic properties- problems.

9. Trigonometric equations: concept of a solution, principal value and general solution of trigonometric equations :

   sin x =k , cos x= k, tan x =k.

   Solutions of simple quadratic equations, equations involving usage of transformations-problems.

10. Properties and solutions of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- solving a triangle-problems.
11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
12. Complex Numbers: Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form (Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III

Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of a point, Circle definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points - general equation of a circle - finding center, radius.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms.

UNIT-IV

Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems-Continuity of a function at a point- Simple Examples only.
17. Concept of derivative- definition (first principle) - different notations-derivatives of elementary functions - problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point. Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.
20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

Reference Books :

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS

Subject Title : Engineering Physics
Subject Code : Common -103
Periods per week : 04
Total periods per year : 120

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	12	13	1	1
3.	Kinematics	14	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	12	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	12	13	1	1
11.	Modern Physics	08	03	1	-
	Total:	**120**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

1.1 Explain the concept of Units
1.2 Define the terms
a) Physical quantity, b) Fundamental physical quantities and
c) Derived physical quantities
1.3 Define unit
1.4 Define fundamental units and derived units
1.5 State SI units with symbols
1.6 State Multiples and submultiples in SI system
1.7 State Rules of writing S.I. units
1.8 State advantages of SI units
1.9 Define Dimensions
1.10 Write Dimensional formulae
1.11 Derive dimensional formulae of physical quantities
1.12 List dimensional constants and dimensionless quantities
1.13 State the principle of Homogeneity of Dimensions
1.14 State the applications of Dimensional analysis
1.15 State the limitations of dimensional analysis
1.16 Solve problems

2.0 Understand the concept of Elements of Vectors

2.1 Explain the concept of Vectors
2.2 Define Scalar and Vector quantities
2.3 Give examples for scalar and vector quantities
2.4 Represent vectors graphically
2.5 Classify the Vectors
2.6 Resolve the vectors
2.7 Determine the Resultant of a vector by component method

2.8 Represent a vector in space using unit vectors (I, j, k)
2.9 State triangle law of addition of vectors
2.10 State parallelogram law of addition of vectors
2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
2.12 Derive expression for magnitude and direction of resultant of two vectors
2.13 State polygon law of addition of vectors
2.14 Explain subtraction of vectors
2.15 Define Dot product of two vectors with examples (Work done, Power)
2.16 Mention the properties of Dot product
2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
2.18 Mention the properties of Cross product.
2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

3.1 Write the equations of motion in a straight line
3.2 Explain the acceleration due to gravity
3.3 Derive expressions for vertical motion
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.5 Explain projectile motion with examples
3.6 Explain Horizontal projection
3.7 Derive an expression for the path of a projectile in horizontal projection
3.8 Explain oblique projection
3.9 Derive an expression for the path of projectile in oblique projection
3.10 Derive formulae for projectile in oblique projection
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
e) Horizontal Range, f) Maximum range
3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

4.1 Define friction
4.2 Classify the types of friction and define
4.3 Explain the concept of Normal reaction
4.4 State the laws of friction
4.5 Define coefficients of friction
4.6 Explain the Angle of friction
4.7 Derive an expression for acceleration of a body on a rough horizontal surface
4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
4.9 Define Angle of repose
4.10 Derive expressions for acceleration of a body on a smooth inclined plane (up and down)
4.11 Derive expressions for acceleration of a body on a rough inclined plane (up and down)
4.12 List the Advantages and Disadvantages of friction
4.13 Mention the methods of minimizing friction
4.14 Solve the related numerical problems

5.0 Understand the concepts of Work, Power, and Energy

5.1 Define the terms 1.Work, 2. Power and Energy
5.2 State SI units and dimensional formulae for 1.Work, 2. Power, and Energy
5.3 Define potential energy and state examples
5.4 Derive the expression for Potential energy
5.5 Define kinetic energy and state examples
5.6 Derive the expression for kinetic energy

5.7 State and derive Work- Energy theorem
5.8 Derive the relation between Kinetic energy and momentum
5.9 State the law of conservation of energy and mention examples
5.10 Verify the law of conservation of energy in the cases of a freely falling body and vertically projected body in the upward direction
5.11 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

6.1 Define Simple harmonic motion
6.2 Give examples for Simple harmonic motion
6.3 State the conditions of Simple harmonic motion
6.4 Explanation of SHM in terms of projection of circular motion on any one of the diameters of the circular path
6.5 Derive expression for displacement
6.6 Derive expression for velocity
6.7 Derive expression for acceleration
6.8 Derive expression for Time period and frequency of S H M
6.9 Define phase of S H M and explain from the expression of displacement
6.10 Define Ideal simple pendulum and derive expression for Time period of simple pendulum
6.11 State the laws of motion of simple pendulum and mention formulae
6.12 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

7.1 Explain the concept of expansion of gases
7.2 State and explain Boyle's law and also express it in terms of density
7.3 Define absolute zero temperature
7.4 Explain absolute scale of temperature
7.5 State Charles laws in terms of absolute temperature and explain
7.6 Define ideal gas and distinguish from real gas
7.7 Derive Ideal gas equation
7.8 Define Specific gas constant and Universal gas constant
7.9 Explain why universal gas constant is same for all gases
7.10 State SI unit and dimensional formula of universal gas constant
7.11 Calculate the value of universal gas constant
7.12 State the gas equation in different forms (as a function of density and mass)
7.13 Distinguish between r and R
7.14 State and Explain Isothermal process
7.15 State and Explain adiabatic process
7.16 Distinguish between isothermal and adiabatic processes
7.17 State first and second laws of thermodynamics and state applications
7.18 Define specific heats & molar specific heats of a gas and differentiate them
7.19 Derive the relation $C_p - C_v = R$ (Mayer's Equation)
7.20 Solve the relavent numerical problems

8.0 Understand the concept of Sound

8.1 Define the term sound
8.2 Explain longitudinal and transverse wave motion and state differences
8.3 Distinguish between musical sound and noise
8.4 Explain noise pollution and state SI unit for intensity level of sound
8.5 Explain causes of noise pollution
8.6 Explain effects of noise pollution
8.7 Explain methods of minimizing noise pollution
8.8 Explain the phenomenon of beats
8.9 State the applications of beats
8.10 Define Doppler effect

8.11 List the Applications of Doppler effect
8.12 Define reverberation and reverberation time
8.13 Write Sabine's formula and name the parameters contained
8.14 Define and Explain echoes and also state its applications
8.15 State conditions of good auditorium
8.16 Solve the related numerical problems

9.0 Understand the properties of matter

9.1 Define the term Elasticity
9.2 Define the terms stress and strain and also define different types of stress and strain
9.3 State the units and dimensional formulae for stress and strain
9.4 State and explain Hooke's law
9.5 Define surface tension and state examples
9.6 Explain Surface tension with reference to molecular theory
9.7 Define angle of contact
9.8 Define capillarity
9.9 Write the formula for surface tension based on capillarity and name the parameters
9.10 Explain the concept of Viscosity
9.11 Mention examples of Viscosity
9.12 State Newton's formula for viscous force and explain
9.13 Define co-efficient of viscosity and write its units and dimensional formula
9.14 Explain the effect of temperature on viscosity of liquids and gases
9.15 State Poiseulle's equation for Co-efficient of viscosity and name the physical quantities involved
9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

10.1 Explain the concept of Electricity
10.2 State Ohm's law and write the formula
10.3 Explain Ohm's law
10.4 Define specific resistance, conductance and state their units
10.5 State Kichoff's laws
10.6 Explain Kichoff's laws
10.7 Describe Wheatstone's bridge with legible sketch
10.8 Derive an expression for balancing condition of Wheatstone's bridge
10.9 Describe Meter Bridge experiment for the determination of resistivity with a neat circuit diagram
10.10 Write the formula in Meter Bridge to determine specific resistance
10.11 Explain the concept of magnetism
10.12 State the Coulomb's inverse square law of magnetism
10.13 Define magnetic field and magnetic lines of force and write the properties of magnetic lines of force
10.14 State the Magnetic induction field strength and mention its units and dimensionsal formula
10.15 Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field
10.16 Derive Magnetic induction field strength at a point on the axial line
10.17 Derive Magnetic induction field strength at a point on the equatorial line
10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

11.1 State and Explain Photo-electric effect
11.2 Write Einstein's photoelectric equation and explain
11.3 State laws of photoelectric effect
11.4 Explain the Working of photoelectric cell

11.5 List the Applications of photoelectric effect
11.6 Recapitulate refraction of light and its laws
11.7 Define critical angle
11.8 Explain the Total Internal Reflection
11.9 Explain the principle and working of Optical Fiber
11.10 Mention types of optical fibbers
11.11 List the applications of Optical Fiber
11.12 Define super conductor and superconductivity and mention examples for superconductors
11.13 State the properties of superconducting materials
11.14 List the applications of superconductors

COURSE CONTENT

1. Units and Dimensions:
Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units- Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Advantages and limitations of Dimensional analysis- - Problems.

2. Elements of Vectors:
Scalars and Vectors –Types of vectors(Proper Vector, Null Vector, Unit Vector, Equal , Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors–Subtraction of vectors- Dot and Cross products of vectors-Problems

3. Kinematics
Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range - problems

4. Friction:
Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction— Motion of a body over a horizontal surface- smooth inclined plane- rough inclined plane- Advantages and disadvantages of friction- Methods of reducing friction – Problems

5. Work, Power and Energy:
Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy- Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems

6. Simple Harmonic Motion:
Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum- Problems

7. Heat and Thermodynamics:
Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between r and R- Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats - molar specific heats of a gas –Derivation of Mayer's Equation- Problems

8. Sound:

Sound- Nature of sound- Types of wave motion -musical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Conditions of good auditorium- Problems

9. **Properties of matter**

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law- Definition of surface tension- Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseuille's equation for Co-efficient of viscosity- The related numerical problems

10. Electricity & Magnetism:

Ohm's law and explanation- Specific resistance- Kirchoff 's laws- Wheatstone's bridge - Meter bridge- Coulomb's inverse square law magnetic field- magnetic lines of force-Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line –problems.

11. Modern Physics;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect- Total internal reflection- fiber optics- -principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- superconductivity - applications

REFERENCE BOOKS

1. Intermediate physics Volume-I & 2 — Telugu Academy (English version)
2. Unified physics Volume 1,2,3 and 4 — Dr.S.L Guptha and Sanjeev Guptha
3. Text book of physics Volume I — Resnick & Holiday
4. Text book of applied physics — Dhanpath Roy
5. Fibre optics — D.A Hill
6. NCERT Text Books ---------- XI & XII Standard

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	14	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	12	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	12	13	0	1	0	0	1	0
11.	Modern Physics	08	03	1	0	0	0	0	0
	Total:	**120**	**110**	**3**	**5**	**2**	**2**	**5**	**1**

C – 16, ENGINEERINGCHEMISTRY &ENVIRONMENTALSTUDIES
(Common to all Branches)

Subject Title	**:**	**Engineering Chemistry & Environmental Studies**
Subject Code	**:**	**Common-104**
Periods per week	**:**	**04**
Total periods per year	**:**	**120**

Scheme of instruction and examination Time Schedule

S.No	Major topic	No of Periods	Weightage of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
A. ENGINEERING CHEMISTRY										
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
B. ENVIRONMENTALSTUDIES		18	16	1	1	0	0	1	0	
total		120	110	6	2	2	3	3 1/2	1 1/2	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A.ENGINEERINGCHEMISTRY

1.0 Understand the concept of Atomic structure

1.1 Explain the charge and mass of fundamental particles of an atom (electron, proton and neutron)

1.2 Explain the concept to f atomic number and mass number.

1.3 State the Postulates of Bohr's atomic theory and its limitations.

1.4 Explain the significance of four Quantum numbers.

1.5 Explain 1. Aufbau principle, 2 Pauli's exclusion principle 3 Hund's rule.

1.6 Define Orbital in an atom.

1.7 Draw the shapes of s,pandd - Orbitals .

1.8 Distinguish between Orbit and Orbital

1.9 Write the electronic configuration of elements up to atomic number 30

1.10 Explain the significance of chemical bonding

1.11 Explain the Postulates of Electronic theory of valency

1.12 Define the types of Chemical bonding viz., Ionic, Covalent bonds.

1.13 Explain the types of Chemical bonding viz., Ionic, Covalent bonds with examples.

1.14 Explain bond formation in NaCl and MgO.

1.15 List Properties of Ionic compounds

1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method.

1.17 List Properties of Covalent compounds

1.18 Distinguish between properties of ionic compounds and covalent compounds.

1.19 Structures of ionic solids-define a) Unit cell b) co-ordination number.

1.20 Structures of Unit cells of NaCl and CsCl.

1.21 Define the term. Oxidation number.

1.22 Calculate the Oxidation Number of underlined atoms in the following examples
a)K$\underline{Mn}O_4$ b) $K_2\underline{Cr}_2O_7$ c) H$\underline{N}O_3$ d) $H_2\underline{S}O_4$ e) $\underline{Cl}O_4^-$ f) $\underline{N}H_4^+$

1.23 Differentiate between Oxidation Number and Valency

2.0 Calculate Molarity and Normality of given Solution

2.1 Define the terms 1.Solution, 2.Soluteand 3.Solvent

2.2 Classify solutions based on physical state and solubility

2.3 Define mole

2.4 Problems on 'Mole concept'

2.5 Define the terms 1. Atomic weight, 2.Molecular weight and 3. Equivalent weight

2.6 Calculate Molecular weight and Equivalent weight of given Acids,($HCl, H_2SO_4 HNO_3$)Bases (NaOH, KOH, $Ca(OH)_2$) and Salts (NaCl, Na_2CO_3, $CaCO_3$)

2.7 Define 1.Molarity, 2.Normality of solutions

2.8 Solve Numerical problem son Molarity and Normality

a) calculate the Molarity or Normality if weight of solute and volume of solution are given

b) calculate the weight of solute if Molarity or normality with volume of solution are given

c) problems on dilution to convert high concentrated solutions to low concentrated solutions

3.0 Understand the concepts of Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases

3.2 State the limitations of Arrhenius theory of Acids and Bases

3.3 Explain Bronsted – Lowry theory of acids bases

3.4 State the limitations of Bronsted – Lowry theory of acids bases

3.5 Explain Lewis theory of acids and bases

3.6 State the limitations of Lewis theory of acids and bases

3.7 Explain the Ionic product of water

3.8 Define pH and explain Sorens on scale

3.9 Solve the Numerical problems on pH(Strong Acids and Bases)
3.10 Define Buffer solution
3.11 Give atleast three examples for Buffer solutions
3.12 State the applications of Buffer solution

4.0 Understand the Principles of Metallurgy

4.1 List at least eight Characteristics of Metals
4.2 Distinguish between Metals and Non Metals
4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4.Fluxand 5.Slag
4.4 Describe the methods of concentration of Ore; 1.Handpicking,2.Levigation, and 3. Froth Floatation
4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.
4.6 Explain the purification of Metals by Electrolytic Refining
4.7 Define an Alloy
4.8 Write the Composition of the following alloys:1.Brass, 2. Germansilver, 3 Nichrome
4.9 List the uses of the following Alloys: 1. Brass, 2.Germansilver, 3.Nichrome

5.0 Understand the concepts of Electrochemistry

5.1 Define the terms1. Conductor, 2. Insulator, 3.Electrolyte 4.Non–electrolyte
5.2 Distinguish between metallic conduction and Electrolytic conduction
5.3 Explain electrolysis by taking example fused NaCl
5.4 Explain Faraday's laws of electrolysis
5.5 Define 1. Chemical equivalent (E) 2. Electrochemicalequivalent (e) and their relation.
5.6 Solve the Numerical problems based on Faraday's laws of electrolysis
5.7 Define Galvanic cell
5.8 Explain the construction and working of Galvanic cell
5.9 Distinguish between electrolytic cell and galvanic cell
5.10 Explain the electrode potentials and standard electrode potentials
5.11 Explain the electro chemical series and its significance
5.12 Explain the emfofa cell.
5.13 Solve the numerical problems on emfof the cell based on standard electrode potentials.

6.0 Understand the concept of Corrosion

6.1 Define the term corrosion
6.2 state the Factors influencing the rate of corrosion
6.3 Describe the formation of a)composition cell, b)stress cell ,c) concentration cell during corrosion.
6.4 Define rusting of iron and Explain the mechanism of rusting of iron.
6.5 Explain the methods of prevention of corrosion:
a)Protective coatings (anodic and cathodic coaitings)
b) Cathodic protection(Sacrificial anode process and Impressed–voltage process)

7. 0 Understand the concept of Water Technology

7.1 State the various Sources of water like Surface water and sub-surface water.

7.2 Define the terms soft water and hard water with respect to soap consumption.

7.3 Define the term hardness of water

7.4 Types of hardness of water 1.Temporary hardness 2. Permanent hardness

7.5 List the salts that causing hardness of water(with Formulae)

7.6 State the disadvantages of using hard water in industries

7.7 Define Degree of hardness, units of hardness(mg/L) or ppm.

7.8 Explain the methods of softening of hard water:a) Ion-Exchange process, b)Permutit process or zeolite process

7.9 Concept of Osmosis and Reverse Osmosis with examples .

7.10 State the applications of Reverse Osmosis.

7.11 State essential qualities of drinking water.

8.0 Understand the concepts of Polymers

8.1 Explain the concept of polymerisation

8.2 Describe the methods of polymerization a) addition polymerization of Ethylene b)condensation polymerization of phenol and formaldehyde(Only flow chart i.e. without chemical equations)

8.3 Define the term plastic

8.4 Classify the plastics with examples

8.5 Distinguish between the rmo and thermo setting plastics

8.6 List the Characteristics of plastics

8.7 State the advantages of plastics over traditional materials

8.8 State the disadvantages of using plastics.

8.9 Explain the methods of preparation of the following plastics:
1.Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde

8.10 Explain the uses of the following plastics:
1.Polythene, 2. PVC, 3.Teflon, 4.Polystyrene and 5. Urea formaldehyde

8.11 Define the term natural rubber

8.12 write the structural formula of Natural rubber

8.13 Explain the processing of Natural rubber from latex

8.14 List the Characteristics of natural rubber

8.15 Explain the process of Vulcanization

8.16 List the Characteristics of Vulcanized rubber

8.17 Define the term Elastomer

8.18 Describe the preparation of the following synthetic rubbers a) Buna-s and b)Neo prene rubber

8.19 List the uses of the following synthetic rubbers a) Buna-s and b)Neo prene rubber

9.0 Understand the concepts of Fuels

9.1 Define the term fuel

9.2 Classify the fuels based on physical state–solid, liquid and gaseous fuels,

9.3 Classify the fuels based on occurrence-primary and secondary fuels

9.4 List the characteristics of good fuel

9.5 State the composition and uses of gaseous fuels:
a)water gas, b)producer gas, c)natural gas, d)coal gas, e)Biogas and f) acetylene

B. ENVIRONMENTALSTUDIES

1.1 Define the term environment

1.2 Explain the scope and importance of environmental studies

1.3 Segments of environment 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere,

1.4 Define the following terms 1)Pollutant, 2).Pollution, 3).Contaminant, 4)receptor, 5)sink, 6) particulates, 7)dissolved oxygen, 8)Threshold limit value, 9).BOD, and 10).COD 11) eco system .

1.5 State the renewable and non renewable energy sources with examples.

1.6 Define the terms:
1).Producers, 2).Consumers and 3).Decomposers with examples.

1.7 Explain bio diversity and threatst obiodiversity

1.8 Define air pollution

1.9 Classify the air pollutants-based on origin and physical state of matter.

1.10 Explain the causes of Air pollution.

1.11 Explain the effects of air pollution on human beings, plants and animals.

1.12 State the uses of forest resources.

1.13 State the deforestation and its causes and effects.

1.14 Explain the 1.) Green house effect , 2) Ozone layer depletion and 3) Acidrain.

1.15 Explain the methods of control of Air pollution

1.16 Define Water pollution

1.17 Explain the causes of Water pollution

1.18 Explain the effects of Water pollution on living and Non-living things.

1.19 Explain the methods of control of Water pollution.

COURSE CONTENT

A. ENGINEERINGCHEMISTRY

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers – Aufbau principle - Hund's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples–Properties of Ionic and Covalent compounds- structures of ionic crystals NaCl, CsCl.

,**Oxidation Number**- calculations, differences between Oxidation Number and Valency.

2. Solutions

Introduction-concentration methods – Mole concept, Molarity, Normality, Equivalent weights, Numerical problems on Mole, Molarity and Normality.

3. Acids and Bases

Introduction – Theories of acids and bases and limitations – Arrhenius theory-Bronsted –Lowry theory – Lewis acid base theory – Ionic product of water– pH and related numerical problems–Buffer solutions–Applications.

4. Principles of Metallurgy

Characteristics of Metals and distinction between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. Electrochemistry

Conductors, insulators, electrolytes– electrolysis – Faraday's laws of electrolysis-numerical problems – Galvanic cell – standard electrode potential – electrochemical series–emf and numerical problems on emfofa cell

6. Water technology

Introduction–soft and hard water–causes of hardness–types of hardness
–dis advantages of hard water – degree of hardness (ppm) – softening methods – permut it process – ion exchange process– drinking water –Osmosis, Reverse Osmosis –Applications of Reverse osmosis

7. Introduction - factors influencing corrosion - composition, stress and concentration cells–rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials –Disadvantages of using plastics – preparationandusesofthefollowingplastics:1.Polythene 2.PVC 3.Teflon 4.Polystyrene 5. Urea formal dehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers, Buna-s, Neoprene rubber and their uses.

9. Fuels

Definition and classification of fuels–characteristics of good fuel-composition and uses of gaseous fuels.

B. ENVIRONMENTALSTUDIES

Introduction– environment –scope and importance of environmental studies important terms– renewable and non-renewable energy sources–Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Bio diversity.

Air pollution – causes-Effects– forest resources: uses and over exploitation, deforestation, acid rain, greenhouse effect –ozone depletion – control of air pollution – Water pollution – causes – effects – control measures,

REFERENCEBOOKS

1.	Intermediate chemistry Vol 1&2	Telugu Academy
2.	Intermediate chemistry Vol 1&2	Vikram Publishers
3.	Intermediate chemistry Vol 1&2	Vignan Publishers &Deepthi Publishers
4.	Engineering Chemistry	Jain & Jain
5.	Engineering Chemistry	O.P. Agarwal, Hi-Tech.
6.	Engineering Chemistry	Sharma
7.	Engineering Chemistry	A.K. De

SURVEYING–I

Subject Title : Surveying–I
Subject Code : C-105
Periods/Week : 05
Periods/Year : 150

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay type
1.	Classification of surveying	10	08	01	1/2
2.	Chain Surveying	35	26	02	02
3.	Compass Surveying	35	26	02	02
4.	Levelling	60	42	04	03
5.	Minor Instruments	10	08	01	1/2
	Total	150	110	10	08

OBJECTIVES:

Upon completion of this course, student shall be able to

1.0 Knows basic concepts of Surveying

1.1 States the concept of surveying
1.2 States the purpose of surveying.
1.3 States the units of linear and angular measurements in Surveying
1.4 States the instruments used for taking linear and Angular measurements
1.5 States the classification of surveys.
1.6 States the fundamental principles of surveying.

2.0 Understands the principles of Chain Surveying

2.1 Explains the functions of different equipment used in Chain Surveying.
2.2 Explains methods of ranging and chaining a line.
2.3 Lists the operations involved in chaining on flat and sloping ground and when high ground intervenes.
2.4 Describes the method of setting out right angles with or without cross staff.
2.5 Explain the principles used in the chain triangulation
2.6 Explains the method of recording field observations.
2.7 Explain the errors in chain surveying
2.8 Determines the corrections for incorrect length of chain
2.9 Explains the methods of overcoming the different obstacles in chain surveying.
2.10 Calculates the areas using analytical methods only.

3.0 Understands the principles of Compass Surveying

3.1. States the purpose and principle of Compass Surveying.
3.2. Identifies the parts of Prismatic Compass and states their Functions.
3.3. Defines the terms:- Whole Circle Bearing, Quadrantal Bearing, True Meridian, Magnetic Meridian, True Bearing, Magnetic Bearing, Declination, Dip & Local attraction.

3.4. Converts Whole Circle Bearing into Quadrantal Bearing and vice versa.
3.5. Explains local attraction and its effect.
3.6. Determines corrected bearings for local attraction.
3.7. Computes the included angles and true bearings of lines in a Compass Closed traverse from data.
3.8. Explains the operations involved in field in compass Surveying
3.9. Explains method of recording field notes.
3.10. Explains the method of plotting Compass Survey and correcting for closing error by Bowditch method.
3.11. Explains Errors in Compass Surveying-Personal, Instrumental and Natural.

4.0 Understands the principles of levelling for different engineering purposes

4.1 Define levelling
4.2 List the types of levelling instruments
4.3 DefineDatum or Datum plane,Reduced level, Level surface, Horizontal surface,. Vertical Line . Station. Mean sea level, and. Bench Mark
4.4 List the component parts of a Dumpy level and their functions
4.5 List the temporary adjustments of a Dumpy level.
4.6 Explain the steps involved in performing Temporary adjustments of a dumpy level.
4.7 Define Back sight, Fore sight, Intermediate sight and Change Point
4.8 List types of levelling staves
4.9 Tabulate the levelling field data
4.10 State two methods of reducing levels
4.11 Compare height of instrument and Rise and fall methods
4.12 Compute reduced levels by height of instrument and Rise and fall methods, and apply check
4.13 List the errors in levelling
4.14 Explain 1. Natural and 2. Instrumental errors
4.15 List the Precautions to be taken to prevent errors in levelling
4.16 Explain the effect of Errors due to 1. Curvature and 2. Refraction
4.17 Compute the error due to 1. Curvature, 2. Refraction and 3. Combined error.
4.18 Apply correction for the above errors.
4.19 List the types of Levelling
4.20 Describe in detail 1. Profile levelling and 2. Reciprocal levelling
4.21 List the errors eliminated in Reciprocal levelling
4.22 Derive the formula for true difference in elevation and true error between two points in reciprocal levelling
4.23 Calculate true difference in elevation in reciprocal levelling
4.24 Calculate Collimation error in reciprocal levelling
4.25 List the fundamental lines of dumpy level
4.26 State the relationship among fundamental lines of dumpy level
4.27 Explain permanent adjustments of a dumpy level (one peg method only)
4.28 Define 1. Contour, 2. Contour interval and 3. Horizontal equivalent
4.29 List the Characteristics of contours
4.30 List the uses of contours
4.31 List the methods of contouring
4.32 Describe contouring by blocks
4.33 Describe contouring by Radial method
4.34 Explain the interpolation of contours
4.35 Explain the method of tracing contour gradient

5.0 Uses and working principles of Minor Instruments

5.1 Explain the construction, principle, uses and working of Pentagraph with sketch

5.2 Explain the construction, uses and working of electronic planimeter with sketch

5.3 Explain the construction, uses and working of abney level with sketch

COURSE CONTENT:

1.0 Classification and Principles of Surveying

1.1 Concept of Surveying
1.2 Purpose of Surveying
1.2 Units of Linear and angular measurements
1.3 Instruments used for taking Linear and angular measurements
1.4 Classification of Survey based on instruments and purpose of field work – Engineering Surveys
1.5 Fundamental principles of surveying.

2.0 Chain Surveying

2.1 Equipment used and their functions, Chains and arrows. Metallic tapes and Steel tapes, ranging rods, offset rods, pegs, plumb bob, Optical square, Line ranger
2.2 Different operations in Chain Surveying- Direct ranging and Indirect ranging
2.3 Chaining on Flat ground, Chainind on sloping ground and chaining when high ground intervenes.
2.4 Setting out right angles with or with out cross staff
2.5 Principles of Chain triangulation. Types of stations and types of chain lines
2.6 Recording field notes – field book-Conventional signs.
2.7 Errors in chain survey
2.8 Correction due to incorrect length of Chain - problems
2.9 Obstacles in chain survey -methods to overcome obstacles – problems.
2.10 Calculations of area – different methods –Average Ordinate, Trapezoidal and Simpson's rules - Problems

3.0 Compass Surveying

3.1 Purpose and principle of compass Survey
3.2 Parts of prismatic compass – identification and their function
3.3 Meridians - true meridian, magnetic meridian, arbitrary Meridian - Bearings- whole Circle bearing, Quadrantal bearing -. Dip, Declination and local attraction
3.4 conversion of whole circle bearing to Quadrantal bearing and vice versa
3.5 Local attraction- and its effects
3.6 Detection of local attraction and computation of corrected bearings – problems
3.7 Determination of included angles and true bearings of lines in a Compass Closed traverse from data – declination - Problems
3.8 Operations involved in field in Compass Survey – Types of compass surveys
3.9 Method of recording field notes
3.10 Plotting of Closed traverse-closing error and adjustments by Bowditch method.
3.11 Errors in Compass Surveying-Personal, Instrumental and Natural.

4.0 Levelling

4.1 Definition of levelling
4.2 Types of levelling instruments
4.3 Definitions :Datum or Datum plane,Reduced level, Level surface, Horizontal surface,. Vertical Line . Station. Mean sea level, and. Bench Mark
4.4 Component parts of a Dumpy level and their functions sketch of dumpy level
4.5 Temporary adjustments of a Dumpy level – setting , levelling and elimination of parallex
4.6 Steps involved in performing Temporary adjustments of a dumpy level.
4.7 Back sight, Fore sight, Intermediate sight and Change Point
4.8 Types of levelling staves
4.9 To 4.12 Tabulation of levelling field data, methods of reducing levels, height of instrument and Rise and fall methods, Comparision of height of instrument and Rise and fall methods, Computation of reduced levels by height of instrument and Rise and fall methods, and apply check
4.13 To 4.14 Errors in levelling -1. Natural and 2. Instrumental errors 3. Personal
4.15 Precautions to be taken to prevent errors in levelling
4.16 To 4.18 Errors due to 1. Curvature and 2. Refraction 3. Combined error - corrections
4.19 To 4.20 Types of Levelling - Describe in detail
4.21 Errors eliminated in Reciprocal levelling
4.22 Derivation of the formula for true difference in elevation and true error between two points in reciprocal levelling
4.23 To 4.24 Calculation of true difference in elevation and collimation error in reciprocal levelling
4.25 To 4.26Fundamental lines of dumpy level relationship among fundamental lines of dumpy level
4.27 Permanent adjustments of a dumpy level (one peg method only)
4.28 1. Contour, 2. Contour interval and 3. Horizontal equivalent
4.29 Characteristics of contours
4.30 Uses of contours
4.31 To 4.33 Methods of contouring – Description in detail contouring by blocks and contouring by Radial method
4.34 Interpolation of contours
4.35 Method of tracing contour gradient

5 Uses and working principles of minor instruments

5.1 Pentagraph
5.2 Electronic Planimeter
5.3 Abney level

REFERENCE

1. Surveying and levelling Vol–1 by KULKARNI and KANETKAR
2. Surveying and Levelling Vol–1 by B.C. PUNMIA.
3. Surveying – 1 by NAGARAJ AND HUSSAIN
4. Surveying – 1 by A.KAMALA
5. Surveying(McGrawhill) by N. N. BASAK.
6. Text Book of Surveying by C.Venkatramaiah (Universities Press)

ENGINEERING MECHANICS

Subject Title : Engineering Mechanics

Subject Code : C-106

Periods/Week : 05

Periods/Semester : 150

TIME SCHEDULE

S.No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Type
1.	Forces & Moments	16	13	1	1
2.	Centroid	20	16	2	1
3.	Moment of Inertia	30	23	1	2
4.	Simple Stresses and Strains	42	29	3	2
5.	Shear force and Bending Moment	42	29	3	2
	Total	**150**	**110**	**10**	**8**

OBJECTIVES:

Upon completion of the course, the student shall be able to

1.0 Understand the concept Equilibrium of Co-Planar forces

1.1 Define the following terms

1. Force
2. Moment
3. Resultant
4. Equilibrium of forces
5. Equilibrant
6. Moment of a couple

1.2 Distinguish between

1.2.1 Scalar and Vector quantities

1.2.2 Co-planar and Non co-planar forces

1.2.3 Parallel and non-parallel forces

1.2.4 Like and unlike parallel forces

1.3 Compute the resultant of two co-planar forces acting at a point by

1.3.1 Law of parallelogram of forces

1.3.2 Triangle law of forces

1.4 Explain 'Lami's Theorem'.

1.4.1 Solve simple problems using Lami's Theorem

1.5 Solve problems on computation of the resultant of a system of coplanar concurrent forces by

1.5.1Law of polygon of forces

1.5.2Resolution of forces

1.6. Solve problems on computation of the resultant of a system of coplanar

parallelforces.

1.7. Explain the properties of a couple.

1.8. State the conditions of equilibrium of rigid body subjected to a number of co- planar forces.

1.8.1. Determine resultant of co-planar concurrent forces by analytical methods.

1.9 List various types of supports (like Simple support, fixed support, hinged support, roller support)

1.10 List various types of beams (like simply supported beams, cantilever, fixed beams, over hanging beams, continuous beams)

1.11 List various types of loading (like point load, uniformly distributed load, uniformly varying load

1.12 To determine support reactions for simply supported beams with point loads and uniformly distributed loads

2.0 **Understand the term Centroid**

2.1 Define Centroid and Centre of gravity

2.2 Distinguish between Centroid and Centre of gravity

2.3 State the need for finding the Centroid and Centre of gravity for various engineering applications

2.4 Calculate the positions of Centroid for simple plane figures from first principles

2.5 Explain the method of determining the Centroid by 'Method of moments'

2.6 Determine the position of Centroid of standard sections-T, L, I, Channel section, Z section, unsymmetrical I section

2.7 Determine the position of Centroid of built up sections consisting of RSJ'S, flange plates and Plane figures having hollow portions

3.0 Compute the Moment of Inertia and radius of gyration

3.1 Define Moment of Inertia (MI), Polar Moment of Inertia, Radius of gyration

3.2 State the necessity of finding Moment of Inertia for various engineering applications

3.3 State 1. Parallel axis theorem 2. Perpendicular axis theorem to determine MI

3.3 Determine Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section, unsymmetrical I section

3.4 Determine MI of standard sections by applying Parallel axis theorem.

3.5 Determine MI of built-up sections by applying Parallel axis theorem.

3.6 Calculate radius of gyration of standard sections.

3.7 Determine the polar M.I for solid and hollow circular section applying Perpendicular axis theorem.

4.0 Calculate the simple Stresses and Strains in structural materials

4.1 Define the following terms

1. Stress
2. Strain
3. Modulus of Elasticity
4. Longitudinal Strain
5. Lateral Strain
6. Poisson's ratio
7. Modulus of rigidity
8. Bulk Modulus
9. Working stress
10. Factor of safety
11. Resilience
12. Strain Energy
13. Proof resilience and
14. Modulus of Resilience

4.2 Distinguish between different kinds of stresses and strains.

4.3 Draw the stress-strain curve for ductile materials (Mild steel) and hence explain the salient points in the curve.

4.4 State Hooke's law and limit of proportionality.

4.5 Solve problems on relationship between simple stress and simple strain under axial loading on uniform bars and stepped bars.

4.6 State the relationship among the elastic constants.

4.7 Solve problems on relationship between elastic constants.

4.8 Calculate stresses in simple and composite members under axial loading

4.9 Explain temperature stress, strain, temperature stresses in composite sections.

4.10 Calculate instantaneous stress and strain Energy due to dynamic loads and impact loading.

4.11 Explain the mechanical properties of materials

5.0 Determine Shear Force and Bending Moment of simple beams analytically

5.1 Define
- a) Cantilever beam
- b) Simply supported beam
- c) Fixed beam
- d) Continuous beam
- e) Overhanging beam

5.2 Define
- a) Point Load
- b) Uniformly Distributed Load

5.3 Describe
- a) Roller support
- b) Hinged support
- c) Fixed support

5.4 Calculate reactions at rollers/hinged and fixed supports for
1. Simply Supported beams,
2. Cantilever beams and
3. Overhanging beams.

5.5 Explain
- a) Shear Force
- b) Bending Moment

5.6 Explain sign conventions used for drawing
1. Shear Force

2. Bending Moment

5.7 Deduce the relationship among the rate of loading, shear force and bending moment

5.8 Determine Shear Force and Bending Moments on
1.Cantilever and
2.Simply Supported beams
for simple cases of loading (Point Load, Uniformly Distributed Load) analytically

5.9 Describe the procedures for sketching the Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD)

5.10 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for Cantilever and Simply Supported Beams

5.11 Define point of contra flexure

5.12 Determine the Shear Force, Bending Moment and point of contra flexure for overhanging beams

5.13 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for overhanging beams

COURSE CONTENT

1. Forces & Moments

a) Definition of force - vectors and scalars - vector representation of a force - systems of forces - co-planar forces.

b) Resultant of forces at a point – Parallelogram Law and Triangle Law of forces – Lami's theorem – Polygon law of forces – Resolution of forces.

c) Parallel forces – like and unlike – moment of force -its units and sense-couple-moment of a couple – properties of a couple.

d) Conditions of equilibrium of a rigid body subjected to a number of co-planar forces.

e) Structural members supporting co - planar forces- Types of supports- Types of beams - Types of loading - Determination of support reactions for simply supported beams with point loads and uniformly distributed loads

2. Centroid

a) Definitions – Centroid, Centre of gravity

b) Position of Centroid of standard figures like rectangle, triangle, parallelogram circle, semi-circle and trapezium.

c) Determination of location of Centroid of standard sections- T, L, I, Channel section, Z section,built up sections consisting of RSJs & flange plates and plane figures having hollow portion.

3. Moment of Inertia

a) Definition of Moment of Inertia
b) Perpendicular and parallel axes theorems
c) Moment of Inertia of standard sections like rectangle, triangle, circle and hallow circular sections
d) Moment of Inertia of built up sections- T, L, I, Channel section, and Z sections using parallel axis theorem
e) Moment of Inertia and radius of gyration of built-up sections consisting of the combinations of RSJ's & flange plates, channels & flange plates etc.
f) Polar Moment of Inertia of solid and hollow circular sections using Perpendicular axis theorem

4. Simple Stresses and Strains

a) Stress and strain – type of stresses and strains
b) Stress strain curves for ductile materials- mild steel, Elastic limit, Limit of proportionality, Yield point, Ultimate stress, Breaking stress, Working stress and Factor of safety.
c) Hooke's law – Young's modulus – deformation under axial load.
d) Shear stress and Shear Strain – Modulus of rigidity.
e) Longitudinal and lateral strain - Poisson's ratio, Bulk Modulus – relationship between elastic constants (proof not required, only problems).
f) Composite sections – effect of axial loads
g) Temperature stresses and strains – hoop stress - Temperature stresses in composite sections
h) Resilience – strain energy-proof resilience and modulus of resilience – maximum instantaneous stress due to gradual, sudden and shock loading.
i) Mechanical properties of materials - elasticity, plasticity, ductility, brittleness, malleability, stiffness, hardness, toughness, creep, fatigue- examples of materials which exhibit the above properties.

5. Shear force and Bending Moment

a. Beams – Types of beams – Cantilevers – Simply supported – Overhanging – Fixed and Continuous.
b. Types of supports – Roller – Hinged – Fixed,
c. Explanation of S.F and B.M. at a section
d. Relation between rate of loading SF and BM
e. Calculation of S.F. and B.M values at different sections for cantilevers Simply supported beams, overhanging beams under point loads and uniformly distributed loads, position and significance of points of contra flexure.
f. Drawing S.F and B.M diagrams by analytical methods – location of points of contra flexure.

REFERENCE BOOKS

1. Engineering Mechanics – N. H.Dubey (Tata McGraw Hill)
2. Engineering Mechanics - R.S.Kurmi
3. Engineering Mechanics - P.K. Abdul Latheef
4. Engineering Mechanics & Statics - Dayaratnam
5. Engineering Mechanics - N. Srinivasulu,

ENGINEERING DRAWING

Subject Title : Engineering Drawing

Subject Code : 107 (Common to all Branches)

Periods/Week : 06

Periods Per Year : 180

Time Schedule

Sno	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	01	-	-	-
2	Engineering Drawing Instruments	05	-	-	-
3	Free hand lettering & Numbering	06	5	1	-
4	Dimensioning Practice	09	5	1	-
5	Geometrical Constructions	21	15	1	1
6	Projection of points, Lines, Planes & Solids	21	10	-	1
7	Auxiliary views	06	5	1	-
8	Sectional views	27	10	-	1
9	Orthographic Projection	33	10	-	1
10	Pictorial drawing	30	10	-	1
11	Development of surfaces	21	10	-	1
	Total	**180**	**80**	**04**	**06**

The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

OBJECTIVES

Upon completion of the subject the student shall be able to

1) **Understand the basic concepts of Engineering Drawing**
   a) State the importance of drawing as an engineering communication medium
   b) State the necessity of B.I.S. Code of practice for Engineering Drawing
   c) Explain the linkages between Engineering drawing and other subjects of study in diploma course

2) Use of Engineering Drawing Instruments

a) Select the correct instruments and draw lines of different orientation
b) Select the correct instruments and draw small and large Circles
c) Select the correct instruments for measuring distances on the drawing
d) Use correct grade of pencil for different types of lines, thickness and given function
e) Select and use appropriate scales for a given application
f) Identify different drawing sheet sizes as per I.S. and Standard Layouts
g) Prepare Title block as per B.I.S. Specifications
h) Identify the steps to be taken to keep the drawing clean and tidy

3) Write Free Hand Lettering and Numbers

a) Write titles using slanting letters and numerals of 7mm, 10mm and 14mm height
b) Write titles using vertical letters and numerals of 7mm, 10mm and 14mm height
c) Select suitable sizes of lettering for different layouts and applications

4) Understand Dimensioning Practice

a) Define "Dimensioning"
b) State the need of dimensioning the drawing according to accepted standards
c) Identify notations of Dimensioning used in dimensioned drawing
d) Identify the system of placement of dimensions in the given dimensioned drawing
e) Dimension a given drawing using standard notations and desired system of dimensioning
f) Dimension standard features applying necessary rules
g) Arrange dimensions in a desired method for a given drawing
h) Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly

5) Apply Principles of Geometric Constructions

a) Divide a given line into desired number of equal parts internally
b) Draw tangent lines and arcs
c) Use General method to construct any polygon
d) Explain the importance of conics
e) Construct ellipse by concentric circles method
f) Construct parabola by rectangle method
g) Construct rectangular hyperbola from the given data
h) Construct involute from the given data
i) Construct cycloid and helix from the given data
j) State the applications of the above constructions in engineering practice

6) Apply Principles of Projection of points, lines, planes & solids

a) Visualize the objects
b) Explain the I-angle and III-angle projections
c) Practice the I-angle projections
d) Draw the projection of a point with respect to reference planes (HP&VP)
e) Draw the projections of straight lines with respect to two reference planes (cases of lines parallel to one plane and inclined to other plane only)
f) Draw the projections of planes (cases of planes perpendicular to one plane and inclined to other plane only)
g) Draw the projections of solids (cases of axis perpendicular to one plane and inclined to other plane only)

7) Understand the need of auxiliary views

a) State the need of Auxiliary views for a given engineering drawing
b) Draw the auxiliary views of a given engineering component

c) Differentiate between auxiliary view and apparent view

8) Appreciate the need of Sectional Views

a) Explain the need to draw sectional views
b) Select the section plane for a given component to reveal maximum information
c) Explain the positions of section plane with respect to reference planes
d) Differentiate between true shape and apparent shape of section
e) Draw sectional views and true sections of regular solids discussed in chapter-6 above
f) Apply principles of hatching

9) Apply principles of orthographic projection

a) Explain the principles of orthographic projection with simple sketches
b) Draw the orthographic view of an object from its pictorial drawing
c) Draw the minimum number of views needed to represent a given object fully

10) Prepare pictorial drawings

a) State the need of pictorial drawings
b) Differentiate between isometric scale and true scale
c) Prepare Isometric views for the given orthographic drawings

11) Interpret Development of surfaces of different solids

a) State the need for preparing development drawing
b) Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramids) using parallel line and radial line methods
c) Prepare development of surface of engineering components like trays, funnels, 90^0 elbows & rectangular ducts

COURSE CONTENT

NOTE

1) **B.I.S Specifications should invariably be followed in all the topics.**
2) **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**
3) **First Angle Projection is to be followed for all Orthographic projection exercises**

1) The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing, Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46–1988 – Mention B.I.S - Role of drawing in engineering education – Link between Engineering drawing and other subjects of study

2) Engineering drawing Instruments

Classification: Basic tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mention the names under each classification and their brief description -Scales: Recommended scales reduced & enlarged scales- Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet

<u>Drawing Plate 1</u>: Consisting of two exercises on use of drawing instruments

3) **Free hand lettering & numbering**

Importance of lettering – Types of lettering -Guide Lines for Lettering- Practicing letters & numbers of given sizes (7mm, 10mm and 14mm) Advantages of single stroke or simple style of lettering

Drawing plate 2: Consisting of five to six exercises on freehand Lettering & Numbering

4) **Dimensioning practice**

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object - Dimensioning size, Location features, surface finish, fully dimensioned Drawing - Notations or tools of dimensioning, dimension line, extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools - Placing dimensions: Aligned system and unidirectional system (SP-46- 1988) - Arrangement of dimensions: Chain, parallel, combined, progressive, and dimensioning by co-ordinate methods - The rules for dimensioning standard features Circles (holes) arcs, angles, tapers, chamfers, and dimensioning of narrow spaces

Drawing Plate 3: Consisting of 8 exercises on Dimensioning methods and rules

5) **Geometric Constructions**

Division of a line: to divide a straight line into given number of equal parts internally and it's examples in engineering applications. Construction of tangent lines: to draw tangent lines touching circles internally and externally. Construction of tangent arcs i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles) ii) Tangent arc of given radius touching a circle or an arc and a given line iii) Tangent arcs of radius R, touching two given circles internally and externally Construction of polygon: Construction of any regular polygon of given side using general method. Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and loci of a moving point, Eccentricity of above curves – Their Engg. applications viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process - Construction of ellipse by concentric circles method - Construction of parabola by rectangle method - Construction of rectangular hyperbola - General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering applications, viz, Gear tooth profile, screw threads, springs etc. - their construction.

Drawing Plate 4: Consisting of eight exercises on construction of polygons

Drawing Plate 5: Consisting of eight exercises on construction of conics

Drawing Plate 6: Consisting of eight exercises on involute, cycloid and helix

6) **Projection of points, lines, planes & solids**

Projecting a point on two planes of projection -Projecting a point on three planes of projection - Projection of straight line i) Parallel to both the planes ii) Perpendicular to one of the planes iii) Inclined to one plane and parallel to other plane - Projection of regular planes- i) Plane perpendicular to HP and parallel to VP and vice versa ii) Plane perpendicular to HP and inclined to VP and vice versa - Projection of regular solids with i) Axis perpendicular to one of the planes ii) Axis parallel to VP and inclined to HP and vice versa

Drawing Plate 7: Consisting of eight exercises on projection of points and Lines

Drawing Plate 8: Consisting of eight exercises on projection of planes

<u>Drawing Plate 9</u>: Consisting of eight exercises on projection of solids

7) **Auxiliary views**

Need for drawing auxiliary views - Explanation of the basic principles of drawing auxiliary views, explanation of reference plane and auxiliary plane - Partial auxiliary view.

<u>Drawing plate 10</u>: Consisting of four exercises on auxiliary views

8) **Sectional views**

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

<u>Drawing Plate 11</u>: Consisting of six exercises on sections of solids

9) **Orthographic Projections**

Meaning of orthographic projection -Using a viewing box model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object - Concept of front view, top view, and side view, sketching these views for number of engineering objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of mitre line in drawing a third view when other two views are given - Method of representing hidden lines - Selection of minimum number of views to describe an object fully

<u>Drawing Plate 12</u>: Consisting of 12 exercises on orthographic projections of engineering objects

10) **Pictorial Drawings**

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale- difference between Isometric view and Isometric projection - Isometric and Non-isometric lines - Isometric drawing of common features like rectangles, circular shapes, non-isometric lines - Use of box and offset methods

<u>Drawing plate 13</u>: Consisting of 12 exercises on Isometric views of engineering objects

11) **Development of Surfaces**

Need for preparing development of surface with reference to sheet metal work -Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal plane and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramids -Types of development: Parallel line and radial line development -Procedure of drawing development - drawings of trays, funnels, 90^0 elbow pipes and rectangular ducts.

<u>Drawing plate 14</u>: Consisting of 5 exercises on development problems

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)

Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)

Engineering Drawing by N.D.Bhatt.

T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.

SP-46-1998 – Bureau of Indian Standards.

SURVEYING – I PRACTICE & PLOTTING

Subject Title : **Surveying – I Practice & Plotting**

Subject Code : **C-108**

Periods/Week : **04**

Periods/Year : **120**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Chain surveying	32
2.	Compass Surveying	24
3.	Levelling	40
4.	Plotting	24
	Total	120

OBJECTIVES:

Upon the completion of the study of this subject the student should be able to

1.0 Applies standard practices to perform chain survey in the field and plots from field data

1.1 Practice unfolding and folding a chain.
1.2 Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the field book..
1.3 Perform indirect ranging and measure the distance between two given stations when a high ground intervenes preventingintervisibility of ends of line.
1.4 Set out a right angle to a given chain line by using chain and cross staff and by using chain only.
1.5 Set and measure offsets for a given object from chain line by
1. Perpendicular offsets 2.Oblique offsets.

1.6 Perform triangulation survey of a given area with chain and cross staff and record all necessary nearby details.
1.7 Calculate the area bounded by the given points by chain triangulation.
1.8 Calculate the area bounded by the given points by chain and cross staff.
1.9 Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements.
1.10 Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements.

2.0 Performs compass survey and plots from field data

2.1 Identify the parts of a prismatic Compass
2.2 Set up the compass at a station and carry out temporary adjustments.
2.3 Take bearings of two points from instrument station and calculate the included angle.
2.4 Perform an open compass survey with Compass and Chain.
2.5 Perform a closed traverse with compass and chain.
2.6 Determine the area bounded by the given points by the method of Radiation.
2.7 Determine the distance between two accessible points involving single setting of the instrument.
2.8 Determine the distance between two inaccessible points involving setting of the instrument at two stations.

3.0 Performs different methods of levelling.

3.1 Identify the parts of Dumpty level and levelling staff
3.2 Performs temporary adjustments for taking observations
3.3 Takes levels for differential levelling.
3.4 Takes levels for check levelling and Reciprocal levelling
3.5 Reduces the levels from field data.
3.6 Takes L.S. and C.S for alignment of Road/Canal.
3.7 Conducting block levels of an area to prepare a contour map

4.0 Applies principles of mapping from the fieldwork and plotting the field work

4.1 Understand the importance & relation between field work & plotting.

COURSE CONTENT

Chain Surveying

a) Practice unfolding and folding of a chain.

b) Ranging and chaining of lines on level ground and recording in field book to measure the distance between two stations.

c) Chaining a line involving indirect ranging.
d) Setting and measuring the offsets-Perpendicular and Oblique offsets
e) Measurement of land areas –cross staff survey
f) Chain triangulation around the building covering a small area with other details taking offsets and recording.
g) Chain triangulation involving a road with other details taking offsets and recording.
h) Chain traversing to survey an area bounded by more than three stations.

Compass Surveying

a) Setting up the compass – observations of bearings
b) Calculation of included angles from the observed bearings
c) Traversing with prismatic compass and chain – open Traverse – Recording.
d) Traversing with prismatic compass and chain- closed traverse - recording.

e) Plotting the closed traverse from field data and adjust for closing error by Bowditch rule.

f) Determination of the area bounded by the given points by the method of Radiation

g) Determination of the distance between two accessible points involving single setting of the instrument

h) Determination of the distance between two inaccessible points involving setting of the instrument at two stations.

3.0 Levelling

3.1 Study of dumpy level, levelling staff and Temporary adjustments of level.

3.2 Taking levels of various points and booking the same in a level field book.

3.3 Differential or Fly levelling, reducing levels by Height of Collimation and Rise & Fall method.

3.4 Differential levelling involving inverted levels.

3.5 Reciprocal levelling.

3.6 Taking levels of Longitudinal Section and Cross Sections of a Road/ Canal

4.0 Plotting

4.1	Conventional signs in Surveying	1 Exercise
4.2	Plotting of land surveys – Chain and Cross Staff survey – Calculation of areas	1 Exercise
4.3	Plotting of chain triangulation, Surveying of small areas around Buildings.	1 Exercise
4.4	Plotting of closed traverse -Compass surveying location of details and adjusting error by Bow ditch's method.	1 Exercise
4.5	Plotting of L.S and C.S.	1 Exercise
4.6	Plotting of contours from block levelling.	1 Exercise
	Total	7 Exercises

PHYSICS LABORATORY

Subject Title : Physics Laboratory
Subject Code : Common -109
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practise with Vernier calipers to determine the volumes and areas of a cylinder and sphere and their comparison etc .
2.0 Practise with Screw gauge to determine thickness of a glass plate, cross sectional area of a wire and volumes of sphere and also their comparison etc
3.0 Verify the parallelogram law and Triangle law
4.0 Determine the value of acceleration due to gravity using Simple Pendulum
5.0 Determine the velocity of sound in air at room temperature and its value at zero degree centigrade
6.0 Calculate the Focal length and focal power of convex lenses using distant object method , U-V method , U-V graph and 1 / U – 1 / V graph methods and their comparison,
7.0 Determine the refractive index of a solid using travelling microscope
8.0 Determine the surface tension of a liquid using travelling microscope
9.0 Determine the viscosity of a liquid using capillary method
10.0 Verify the Boyle's law employing a Quill tube
11.0 Determine the specific resistance of material of a wirel using Meter Bridge
12.0 Drawing magnetic lines of force under N-S and N-N methods and locate null points

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
1. Hands on practice on Vernier Calipers(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the physical quantities of given object	• Read the scales • Calculate the requisite physical quantities of given objects
2. Hands on practice on Screw gauge(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire and other quantities	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire and other quantities
3. Verification of Parallelogram law of forces and Triangle law of forces(03)	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum(03)	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and $l\text{-}T^2$ graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and $l\text{-}T^2$ graph

Name of the Experiment(Periods)	Competencies	Key competencies
5. Velocity of sound in air –Resonance method (03)	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound at room temperature • Calculate velocity of sound at 0^0 C
6. Focal length and Focal power of convex lens (Separate & Combination) (03)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v graphs	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graphs
7. Refractive index of solid using traveling microscope(03)	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope(03)	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water

Name of the Experiment	Competencies	Key competencies

9. Coefficient of viscosity by capillary method(03)	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water
10. Boyle's law verification (03)	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
11. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force(03)	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

CHEMISTRY LABORATORY

Subject Title : Chemistry Laboratory
Subject Code : Common -110
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making solutions of different dilution	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. $KMnO_4$	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA solution	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.

2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.

3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl

4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0 Conduct titrations adopting standard procedures and using Std. $KMnO_4$ solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given

samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions
   a) To determine conductivity
   b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Familiarization of methods for Volumetric analysis (03)	--	--
Preparation of Std Na_2CO_3 and making solutions of different dilution (03)	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions
Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Estimation of HCl solution using Std. Na_2CO_3 solution (03)	▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate
Estimation of NaOH using Std. HCl solution (03)		
Estimation of H_2SO_4 using Std. NaOH solution (03)		
Estimation of Mohr's Salt using Std. $KMnO_4$ (03)		

Determination of acidity of water sample (03) Determination of alkalinity of water sample (03) Determination of total hardness of water using Std. EDTA solution (03) Estimation of Chlorides present in water sample (03) Estimation of Dissolved Oxygen (D.O) in water sample (By titration method) (03)	▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	observations
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method) (03) Determination of pH using pH meter (03) Determination of conductivity of water and adjusting ionic strength to required level (03) Determination of turbidity of water (03)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Estimation of total solids present in water sample (03)	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDEMENTALS LABORATORY
(Common to all Branches)

Subject Title : Computer Fundamentals Laboratory
Subject Code : C-111
Periods/Week : 03
Periods/Year : 90

Time Schedule

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	02	06
II.	Windows Operating System	02	06
III.	MS Word	08	24
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
	Total	30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to wide spread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a) To familiarize with a Computer System and its hardware connections.
   b) To start and Shutdown a Computer correctly.
   c) To check the software details of the computer
   d) To practice Internal and External DOS commands
2. To check the hardware present in your computer.

II. Windows's operating system (Not for end examination)

3. To explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Keyboard	a. Login and logout as per the standard procedure b. Operate mouse & Keyboard
1 (c).	To explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
1(d).	To practice Internal and External DOS commands	a. Practice Internal commands b. Practice External commands	Familiarize with MS-DOS Commands
2.	To check the software details of the computer	c. Find the details of Operating System being used d. Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard Disk Drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste or move commands to organize files and folders	a. Create files and folders rename , arrange and search for the required folder/file

Exp No.	Name of the Experiment	Competencies	Key Competencies
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut for files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS Paint to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS Word. – Home – Insert- Page Layout- References- Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use keyboard and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers

Exp No.	Name of the Experiment	Competencies	Key Competencies
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar- Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move around a Worksheet-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit

Exp No.	Name of the Experiment	Competencies	Key Competencies
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce an Excel Column Chart c. Practice creating any Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
21.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in Home, insert, design, animation , slideshow, Review &View in the PowerPoint	Access required options in the tool bar

Exp No.	Name of the Experiment	Competencies	Key Competencies
22.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation	a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and WordArt f. Use 3d features g. Arrange objects	Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
26.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
27.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.

Exp No.	Name of the Experiment	Competencies	Key Competencies
28.	To Insert audio &video, Hyperlinks in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like *Entrance, Emphasis, Motion Paths &Exit*	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

III SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2016
III SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-301	Engineering Mathematics –II	5	-	75	3	20	80	100
C-302	Strength of Materials & Theory of Structures	6	-	90	3	20	80	100
C-303	Hydraulics	6	-	90	3	20	80	100
C-304	Surveying-II	5	-	75	3	20	80	100
C-305	Construction Materials	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-306	Civil Engineering Drawing-I	-	6	90	3	40	60	100
C-307	Material Testing laboratory	-	3	45	3	40	60	100
C-308	Surveying - II Practice & Plotting	-	4	60	3	40	60	100
C-309	Hydraulics Laboratory	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

ENGINEERING MATHEMATICS – II
(Common to all Branches)

Subject Title : Engineering Mathematics-II
Subject Code : C-301
Periods per week : 05
Periods per Semester : 75

Blue print

S. No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
	Unit - I			R	U	App	R	U	App
1	**Indefinite Integration**	15	21	1	1	0	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Unit - II								
2	**Definite Integration and its applications**	35	60	1	1	3	1	1	$2\frac{1}{2}$
	Unit - III								
3	**Differential Equations**	25	29	2	1	0	1	1	0
	Total	75	110	4	3	3	$2\frac{1}{2}$	$2\frac{1}{2}$	30
			Marks:	12	9	9	25	25	30

R: Remembering type 37 marks
U: Understanding type 34 marks
App: Application type 39 marks

OBJECTIVES

Upon completion of the subject the student shall be able to

Unit-I

1.0 Indefinite Integration

1.1 Explain the concept of Indefinite integral as an anti-derivative.

1.2 State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\,dx$ and $\int ku\,dx$ where k is constant and u, v are functions of x.

1.3 Solve integration problems involving standard functions using the above rules.

1.4 Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\,dx$ where $f(x)\,dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\,dx$

iii) $\int f'(x)/[f(x)]\,dx$

iv) $\int f\{g(x)\}\,g'(x)\,dx$

1.5 Find the Integrals of *tan x, cot x, sec x* and *cosec x* using the above.

1.6 Evaluate the integrals of the form $\int Sin^m\theta\ Cos^n\theta.\,d\theta$ where m and n are positive integers.

1.7 Evaluate integrals of powers of *tan x* and *sec x*.

1.8 Evaluate the Standard Integrals of the functions of the type

$$i)\ \frac{1}{a^2+x^2},\ \frac{1}{a^2-x^2},\ \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}},\ \frac{1}{\sqrt{a^2-x^2}},\ \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2},\ \sqrt{x^2+a^2},\ \sqrt{a^2-x^2}$$

1.9 Evaluate the integrals of the type

$$\int \frac{1}{a \pm bSin\theta}d\theta, \int \frac{1}{a \pm b\cos\theta}d\theta \text{ and } \int \frac{1}{a\cos\theta \pm b\sin\theta \pm c}d\theta\ .$$

1.10 Evaluate integrals using decomposition method.

1.11 Evaluate integrals using integration by parts with examples.

1.12 State the Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.

1.13 Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\,dx$.

Unit-II

(a) Understand definite integral and its properties

2.1 State the fundamental theorem of integral calculus

2.2 Explain the concept of definite integral.

2.3 Calculate the definite integral over an interval.

2.4 State various properties of definite integrals.

2.5 Evaluate simple problems on definite integrals using the above properties.

(b) Real life applications of definite integrals

2.6 Explain definite integral as a limit of sum by considering an area.

2.7 Find the areas under plane curves and area enclosed between two curves using integration.

2.8 Obtain the volumes of solids of revolution.

2.9 Obtain the mean value and root mean square value of the functions in any given interval.

2.10 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and provide some examples.

(c) Certain special integrals: Laplace Transforms

2.11 Write the definition of Laplace Transform and explain sufficient conditions for its existence.

2.12 Provide formulae for Laplace transforms of standard functions.

2.13 State Linear property, First shifting property, Change of Scale property for Laplace transforms. Solve simple problems using these properties.

2.14 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^{(n)}(t)$, $\int_0^t f(u)\,du$ in terms of Laplace transform of $f(t)$. Provide simple examples on these functions.

2.15 Define unit step function and write the Laplace Transform of unit step function.

State second shifting property.

2.16 Define inverse Laplace Transform and write inverse Laplace Transform of standard functions. Solve simple problems.

2.17 Write first shifting property of inverse Laplace Transform with examples

2.18 Define convolution of two functions and state convolution theorem with few examples for understanding only.

(d) Understand the Fourier series expansion of functions

2.19 Define Fourier series of a function on the interval $(c, c+2l)$ and state sufficient conditions for its existence. Write the Euler's formulae for determining the Fourier coefficients.

2.20 Find Fourier series of simple functions in the range$(0,2l), (0,2\pi), (-l,l)\ and\ (-\pi,\pi)$.

2.21 Find Fourier coefficients for even and odd functions in the interval $(-l,l)\ and\ (-\pi,\pi)$ in simple examples.

2.22 Define half range Fourier sine and cosine series of a function over the interval $(0,\ l)$ with examples.

3.0 Introduction to Differential Equations

3.1 Define a Differential equation, its order, degree

3.2 Form a differential equation by eliminating arbitrary constants.

3.3 Solve the first order first degree differential equations by the following methods:

i. Variables Separable.
ii. Homogeneous Equations.
iii. Exact Differential Equations
iv. Linear differential equation of the form dy/dx + Py = Q, where P and Q are functions of x or constants.
iv. Bernoulli's Equation (Reducible to linear form.)

3.4 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, Complex conjugates.

3.5 Solve the higher order homogeneous differential equations with constant coefficients.

3.6 Explain the concept of complementary function, particular Integral and general solution of a differential equation.

3.7 Solve n^{th} order differential equation of the type $f(D)\,y = X$ where $f(D)$ is a polynomial of nth order and X is a function of the form $k, e^{ax}, Sinax, Cosax, x^n$.

3.8 Solve simple problems leading to engineering applications

COURSE CONTENT

Unit-I
Indefinite Integration:

1. Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of indefinite integral. Integration by substitution or change of variable. Integrals of the form $\sin^m\theta.\cos^n\theta$. where m and n are positive integers. Integrals of tan x, cot x, sec x, cosec x and powers of tan x, sec x by substitution.

Evaluation of integrals which are reducible to the following forms :

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

Integration by decomposition of the integrand into simple rational, algebraic functions. Integration by parts, Bernoulli's rule.

Unit-II
Definite Integral and its applications:

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Volumes of solids of revolution. Mean and RMS values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

. Definition, sufficient conditions for existence of Laplace Transform (LT), LT of elementary functions, linearity property, scale change property, first shifting property, multiplication by t^n, division by t, LT of derivatives and integrals, unit step function, LT of unit step function, second shifting theorem, inverse Laplace transforms- shifting

theorems and change of scale property, multiplication by s^n and division by s – examples of inverse LT using partial fractions – convolution theorem (no proof).

Representation of a function in Fourier series over the interval $(c, c + 2l)$, Give sufficient conditions for existence of Fourier series. Euler's formulae for Fourier coefficients, Finding Fourier coefficients for simple functions, elementary even and odd functions. Define half range Fourier serie

Unit -III

Differential Equations:

Definition of a differential equation-order and degree of a differential equation-formation of differential equations-solution of differential equation of first order, first degree: variable-separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X, where X is in the form k, e^{ax}, sin ax, cos ax, x^n, (n= 1,2) – complimentary function, particular integral and general solution.

Reference Books:

1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. A Text book of Engg. Mathematics by B.S.Grawel
4. A Text book of Engg. Mathematics by B.V.Ramana- T.Mc Graw Hill Publishers

STRENGTH OF MATERIALS & THEORY OF STRUCTURES

Subject Title : Strength of Materials & Theory of Structures

Subject Code : C-302

Periods/Week : 06

Periods/Semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Theory of simple bending	20	26	02	02
2.	Deflection of beams	20	26	02	02
3	Principal stresses, planes & Mohr's circle	05	03	01	-
4	Torsion & Springs	04	03	01	-
5	Thin cylinders	03	03	01	-
6	Columns	15	23	01	02
7	Dams and Retaining walls	13	13	01	01
8	Stresses in Frames	10	13	01	01
	Total	**90**	**110**	**10**	**08**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understands the Effect of Loading on Beams

1.1 Explains terms: Neutral axis, Modulus of section, Moment of resistance
1.2 States the assumptions made in the theory of simple bending.
1.3 Derives the formula for simple bending – Explain bending stress distribution.
1.4 Solves problems on theory of simple bending.
1.5 Explains shear distribution across rectangular, solid circular and I sections.

2.0 Understands Deflection of Beams under Loading

2.1 Derives the equation of the elastic curve and Relation between curvature, slope and deflection.
2.2 Distinguishes between strength and stiffness of a beam.
2.3 Computes the slope &deflection by Double integration method, Macaulay's method.
2.4 Defines Mohr's theorem(Moment area method)
2.5 Computes the slope &deflection by Mohr's theorem.
2.6 Determines the section of a beam from consideration of strength and stiffness.
2.7 Differentiates statically indeterminate structures from statically determinates structures

2.8 Determines the prop reaction of propped cantilever beams for various types of loadings (point & u.d.l) and draw the S.F.D and B.M.D.

2.9 Draws the deflected shapes of Fixed & Continuous beams under loading and identifies the sagging & hogging moments.

3.0 Understands Principal stresses, Planes & Mohr's Circle.

3.1 Defines the principal stress, principal planes and state the importance of Mohr's circle

4.0 Understands the effects of pure Torsion on Solid and Hollow Circular Shafts - Springs

4.1 Knows the formula for pure torsion of a circular shaft and power transmitted by a shaft.

4.2 Solves the simple problems on torsion applying torsion formula.

4.3 Calculates the deflection of a closely coiled helical spring under a given axial loading.

5.0 Understands the effects of internal pressure on unrivetted thin Cylinders

5.1 Calculates the longitudinal and Hoop stresses in the cylinder under internal pressure, given the dimensions of the thin cylinder.

5.2 Calculates the thickness of a thin cylindrical shell .

6.0 Understands the behaviour of columns under vertical loads

6.1 States the effective lengths of columns for different end conditions.

6.2 Distinguishes between Long and short columns.

6.3 Calculates Slenderness ratio of a column.

6.4 Calculates the load carrying capacity of a column using Euler's and Rankin's formula.

7.0 Understands the Stability of Retaining walls and dams under the action of lateral pressures

7.1 Explains different forces acting on the Gravity Dam.

7.2 Computes the intensity of base pressures acting on the Gravity Dam.

7.3 Explains the stability conditions of Gravity Dams.

7.4 Calculates the base width of the dam based on Stability conditions.

7.5 Explains the Earth pressures acting on the retaining walls.

7.6 Explains different forces acting on the Retaining wall.

7.7 Computes the intensity of base pressures acting on the Retaining Wall without surcharge.

7.8 Explains the stability conditions of Retaining wall.

7.9 Calculates the base width of the Retaining wall based on Stability conditions.

8.0 Understands effect of Dead and Live loads on statically determinate frames

8.1 Differentiates between statically determinate and indeterminate frames.

8.2 Calculates forces in members of a simple truss under dead loads and live loads by method of joints and method of sections.

COURSE CONTENT:

1.0 Stresses in Beams.

1.1 Theory of simple bending-Neutral axis-Modulus of section, Moment of resistance
1.2 Assumptions made in the theory of simple Bending.
1.3 Formula for Theory of simple bending – Bending stress distribution.
1.4 Theory of simple bending-problems
1.5 Shear stresses in Beams -Shear stress distribution across rectangular, solid circular and I sections. (Derivation of formula not required.)

2. 0 Deflection of Beams

2.1 Equation of the elastic curve - Relation between curvature, slope and deflection
2.2 Strength and stiffness of a beam.
2.3 Slope &deflection by Double integration method, Mecaulay's method for simply supported and Cantilever beams subjected to Point loads and uniformly distributed loads
2.4 Mohr's theorem-I & II for slope &deflection.
2.5 Slope & deflection by Mohr's theorem for simply supported and Cantilever beams subjected to Point loads and uniformly distributed loads
2.6 Section of a beam from consideration of strength and stiffness.
2.7 Difference between statically determinate and statically indeterminate structures.
2.8 Prop reaction of propped cantilever beams - various types of loadings (point & u.d.l) - S.F.D and B.M.D.
2.9 Fixed and Continuous beams – degree of static indeterminacy – deflected shapes under loading (no necessity to solve problems on the topic)

3.0 Principal stresses, Planes & Mohr's Circle

3.1 Definition of principal stress, principal planes and importance of Mohr's circle.

4.0 Torsion & Springs

4.1 Theory of pure torsion-Torsion formula-solid and hollow circular shafts subjected to pure torsion-simple problems-shear stress distribution in shafts – power transmitted by a shaft – simple problems
4.2 Calculates the deflection of a closely coiled helical spring under a given axial loading.

5.0 Thin Cylinders

5.1 Longitudinal and Hoop stresses in Unrivetted thin cylinders subjected to internal fluid pressure - calculation of thickness in thin cylinders under internal pressures-problems.

6.0 Columns

6.1 Columns - Effective lengths for different end conditions.
6.2 Columns - Long and short columns – Comparison.
6.3 Slenderness ratio of a column – Rectangular, I, circular, Hollow Circular, Built-up Sections.
6.4 Load carrying capacity by Euler's and Rankin's formula – problems - Limitations.

7.0 Dams and retaining walls

7.1 Forces acting on the Gravity Dam – Eccentricity, middle third rule.

7.2 Intensity of base pressures acting on the Gravity dam for different water storage levels.
7.3 Stability conditions of Gravity Dams.
7.4 Base width of the dam based on Stability conditions – problems.
7.5 Active and passive Earth pressures without surcharge–Angle of internal friction
7.6 Forces acting on the Retaining wall - Eccentricity, middle third rule.
7.7 Intensity of base pressures acting on the Retaining wall.
7.8 Stability conditions of Retaining wall.
7.9 Base width calculation - based on Stability conditions.

8.0 Stresses in frames

8.1 Forces in the members of statically determinate pin jointed frames-method of Joints and method of sections.

REFERENCE BOOKS

1.	Strength of Materials	by	Ramamurtham.
2.	S.M and T.S	by	B.C. punmia.
3.	S.M and T.S	by	Srinivasulu.
4.	Strength of Materials	by	R.S. Khurmi.
5.	Introduction to strength of materials	by	D.S . Prakash rao.
6.	Strength of Materials Vol-I (A practical approach)	by	D.S . Prakash rao.
7.	Introduction to Strength of materials	by	D.S. Prakash rao (Universities Press)

HYDRAULICS

Subject Title : Hydraulics

Subject Code : C-303

Periods/Week : 06

Periods/Year : 90

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Properties of liquids	05	03	1	-
2	Liquid pressure and its measurement	11	13	1	1
3	Flow of liquids	11	13	1	1
4	Flow through orifices and mouth pieces	11	13	1	1
5	Flow over notches and weirs	12	16	2	1
6	Flow through pipes	15	23	1	2
7	Flow though open channels	11	13	1	1
8	Pumps & Water turbines	11	13	1	1
9	Hydro electric power plants	03	03	1	-
	TOTAL	**90**	**110**	**10**	**8**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the properties of liquids

1.1 Scope and importance of hydraulics in civil engineering.

1.2 Define Mass density, Specific weight, Specific gravity, Adhesion, Cohesion, Surface tension, Capillarity, Compressibility, Dynamic viscosity, Kinematic viscosity, Vapour pressure and Cavitation.- States the values of Specific weight, Mass density, Specific gravity for pure water and mercury

1.3 Formulae of Dynamic viscosity, Capillarity, Surface tension and Kinematic Viscosity.

2.0 Understands Liquid pressure and its Measurement

2.1 Distinguishes among atmospheric pressure, gauge pressure and absolute pressure.

2.2 Describes pressure measuring instruments.

2.3 Computes the pressure of a flowing liquid given the readings on a piezometer, simple, differential and inverted differential manometers.

2.4 Computes the total pressure and centre of pressure on a horizontal and vertical surfaces immersed in a liquid.(No derivation of formulae, problems only)

3.0 Understands the General Principles of flow of the Liquids

3.1 Distinguishes the different types of flow of liquids.

3.2 States the equation of continuity and energies of liquid in motion.

3.3 Explains Bernoulli's theorem of total energy of a liquid in motion and its limitations (no proof). Solves problems on application of Bernoulli's theorem.

3.4 Explains the working and use of pitot tube, orifice meter, Venturimeter and Solves problems on pitot tube and horizonjtal Venturimeter (No derivation of formula)

4.0 Understands the function of Orifices and mouth pieces

4.1 Defines orifice and vena-contracta and explains the types of orifices.
4.2 Defines co-efficient of contraction, velocity and discharge.
4.3 States the relationship between Hydraulic Coefficients - Cc, Cv, and Cd. and Solves problems on hydraulic co-efficients.
4.4 State the formula for discharge through large rectangular orifice and states the equations for discharge through Submerged and partially submerged orifices.
4.5 Solves problems on discharge through a large rectangular orifice, Submerged orifices.
4.6 Computes the time of emptying of a prismatic tank by an orifice
4.7 Defines Mouthpiece and Differentiates between orifices and mouth pieces.
4.8 States the different types of mouth pieces with their C_d values and calculates the discharge through a mouth piece from the given details.

5.0 Comprehends the flow over different types of notches and weirs

5.1 Defines a notch and state types of notches.
5.2 States the advantages of triangular notch over rectangular notch.
5.3 States the formulae for the discharge over rectangular, triangular and trapezoidal notches.
5.4 Calculates the discharge over the above notches from the given parameters.
5.5 Defines a weir and Distinguishes sharp crested and broad crested weirs.
5.6 States the formulae for discharge over sharp crested and broad crested weirs.
5.7 Explains the above formulae with modifications for end contractions and velocity of approach.
5.8 Determines the discharge over sharp crested and broad crested weirs under given conditions.

6 Understands the flow through pipes

6.1 Explains the major and minor losses of head of water flowing through pipes stating relevant formulae.
6.2 States Chezy's and Darcy's formulae for friction loss in pipe flow.
6.3 Solves problems on a pipe flow under friction.
6.4 Sketches the Hydraulic gradient and total energy line under different conditions.
6.5 Computes the discharge through parallel pipes and compound pipes connected to a reservoir.
6.6 Differentiates between laminar and turbulent flows.
6.7 State Reynolds's number and critical velocity in pipes.

7 Understands the principles of flow through open channels

7.1 Defines open channel flow and differentiates with pipe flow.
7.2 Defines terms Wetted perimeter and Hydraulic mean depth
7.3 States Chezy's formula for uniform flow through open channels.
7.4 Calculates value of Chezy's constant given Kutter's formula, Manning's formula and Bazin's formula.
7.5 Computes the velocity and discharge in a channel.
7.6 State the conditions for most economical section of rectangular and trapezoidal channels.
7.7 Solves problems on flow through rectangular and trapezoidal channels for the given conditions.

8.0 Understands types and working of pumps and turbines

8.1 Defines pump and States different types of pumps
8.2 Describes the different parts of centrifugal pumps.
8.3 State the use of foot valve and strainer in a centrifugal pump.
8.4 Explain the working of different types of Reciprocating pumps.
8.5 Know the use of jet, air lift and deep well pumps.
8.6 Differences between Centrifugal & Reciprocating pumps.
8.7 Definition of turbine States different types of turbines.
8.8. Explains impulse & reaction turbines and their types.
8.9 Briefly explains with sketches the principle of working of Pelton wheel and Francis turbine.
8.10 Differentiate between impulse and reaction turbines.
8.11 Explain the purpose and types of Draft tubes.

9.0 Knows the general lay-out of Hydro-Electric Power Plants

9.1 Sketches a typical layout of hydro-electric power plants and shows the components.
9.2 Explains the function of surge tank, water hammer effect in pen stocks.

COURSE CONTENT:

1.0 Properties of Liquids

1.1 Scope and importance of hydraulics in Civil Engineering.
1.2 Definition and properties of liquids-as mentioned in specific objectives
1.3 Formulae of Dynamic viscosity, Capillarity, Surface tension, Kinematic Viscosity (problems not required)

2.0 Liquid Pressure and its Measurement

2.1 Atmospheric pressure, gauge pressure and absolute pressure.
2.2 Types of Pressure measuring instruments – Simple and Differential Manometers.
2.3 Determination of the pressure of a flowing liquid given the readings on a piezometer, simple, differential and inverted differential manometers.
2.4 Determination of Total and Centre of Pressure on Plane surface on horizontal and vertical immersed Plane surfaces..(No derivation of formulae, problems only)

3.0 Flow of Liquids

3.1 Types of flow-uniform flow, non-uniform flow, stream-line flow, turbulent flow, steady flow and unsteady flow.
3.2 Energies of liquid in motion-Datum head- pressure head and velocity head-principle of continuity.-problems
3.3 Total energy of liquid in motion-Bernoulli's theorem (without proof) - limitations of Bernoulli's theorem.-problems.
3.4 Practical applications of Bernoulli's theorem- pitot tube, orificemeter and venturimeter -problems on pitot tube and horizontal Venturimeter . (No derivation of formula.)

4.0 Flow through orifices and mouthpieces

4.1 Definition of orifice and vena-contracta –types of orifices. Determination of discharge through small orifice
4.2 Defines co-efficient of contraction, velocity and discharge.
4.3 State the relation between Hydraulic Coefficients - Cc, Cv, and Cd. and solves problems on hydraulic co-efficients.
4.4 Large rectangular orifice-derivation of formula for discharge and states the equations for discharge through Submerged and partially submerged orifices.

4.5 Problems on discharge through a large rectangular orifice, Submerged orifices.
4.6 Problems on determination of time of emptying of a prismatic tank by an orifice.
4.7 Definition of Mouthpiece and Difference between orifices and mouthpieces
4.8 Different types of mouth pieces with their C_d values and determination of discharge through a mouth piece from the given details.

5.0 Flow over Notches & Weirs

5.1 Definition of notch, types of notches-rectangular, triangular and trapezoidal.
5.2 Formulae for Determination of Discharge for the above notches
5.3 State the advantages of triangular notch over rectangular notch.
5.4 Problems on Determination of Discharge for the Notches
5.5 Definition of Weir-types of weirs, sharp-crested and broad crested weirs.
5.6 Formulae for determination of Discharge over a sharp crested weir and broad crested weir.(Mathematical formula)
5.7 Equations for Discharges for above Wiers with velocity of approach and end contractions.
5.8 Determines the discharge over sharp crested and broad crested weirs under given conditions.

6.0 Flow thorough pipes

6.1 Major loss (loss of head due to friction) and minor losses (Loss of head at entrance, loss of head due to sudden enlargement, loss of head due to sudden contraction, loss of head at exit of the pipe) - simple problems.
6.2 Frictional loss in pipes - Chezy's formula and Darcy's formula (without Proof)– problems.
6.3 Solves problems on a pipe flow under friction.
6.4 Hydraulic gradient and total energy line.
6.5 Discharge through parallel and compound pipes connected to a reservoir.
6.6 Laminar and turbulent flow in pipes.
6.7 Reynolds's number and critical velocity.

7.0 Flow through open Channels

7.1 Definition of open channel flow and differences between open channel flow and pipe flow.
7.2 Wetted perimeter and hydraulic mean depth.
7.3 Chezy's formula for discharge for uniform flow (Derivation not necessary).
7.4 Value of 'C' for different surfaces.
  7.4.1 Kutter's formula.
  7.4.2 Manning's fourmula
  7.4.3 Bazin's formula
7.5 Determination of values of the velocity and discharge in a channel
7.6 Conditions for Most economical section of a channel-rectangular and trapezoidal.
7.7 Design of rectangular and trapezoidal channel cross sections – problems.

8.0 Pumps and Turbines

8.1 Definition of pump and different types of pumps
8.2 Different parts of centrifugal pumps.
8.3 Uses of foot valve and strainer in a centrifugal pump.
8.4 Types of reciprocating pumps.
8.5 Uses of jet, air lift and deep well pumps.
8.6 Differences between centrifugal & reciprocating pumps.
8.7 Definition of turbine and different types of turbine.
8.8 Impulse & reaction turbines and their types.

8.9 Brief explanation of principle of working of Pelton wheel and Francis turbine.
8.10 Differences between impulse and reaction turbines.
8.11 Draft tube – Purpose and types.

9.0 Hydro-electric Power Plants

9.1 Sketch of a typical layout of hydro-electric power plants and its components.
9.2 The function of surge tank – water hammer effect in pen stocks.

REFERENCE BOOKS

1. Hydraulics by R.S. Khurmi.
2. Hydraulics & Hydraulic Machines by Modi & sethi.
3. Hydraulics by Jagdishlal.
4. Hydraulics by Reye & Rao
5. Hydraulics by R. K. Bansal.
6. Hydraulics by NITTTR,Chennai

SURVEYING – II

Subject Title : Surveying – II
Subject Code : C-304
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Theodolite survey	20	29	03	02
2.	Trigonometric levelling	13	16	02	01
3.	Tacheometry	16	26	02	02
4.	Curves	16	26	02	02
5.	Total Station	10	13	01	01
	Total	75	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the principles of theodolite surveying for preparation of plans and alignment

1.1 Identifies the parts and functions of a Theodolite
1.2 Lists the fundamental lines of a Theodolite and their relationships.
1.3 List the steps involved in carrying out temporary adjustments for taking observations.
1.4 Explains measuring of horizontal and vertical Angles.
1.5 Steps involved in setting out angles using theodolite.
1.6 Explains the method of conducting traverse survey
1.7 Computes the latitudes, departure of lines and error of closure.
1.8 Types of Errors in theodolite surveying.

2.0 Understands the principles of Trigonometric Levelling

2.1 Calculates the height of an object when the base of the object is accessible.
2.2 Calculates the elevations of the object when the base of the object is inaccessible and instrument stations are
a) in the same vertical plane
b) not in the same vertical plane.

3.0 Understands the principles of Tacheometry to find the elevations and distances of stations

3.1 Explains the types and advantages of Tacheometry.
3.2 Explains the principle of Stadia Tacheometry.

3.3 Finds vertical and horizontal distance of stations by Stadia observations- Problems
3.4 Determination of Tacheometric constants.

4.0 Understands the method of setting out simple curves

4.1 States the definition and notation of a simple curve.
4.2 Computes the elements of simple curve
4.3 Explains the procedure for setting out a simple curve by linear methods using Chain and Tape.
4.4 Explains the procedure for setting out a simple curve by Angular Methods- Single and Double Theodolite.
4.5 Solves problems on setting out a simple curve by linear and angular methods for the given data.

5.0 Understand the principles of total station

5.1 List the parts of total station and their functions
5.2 Explain the setting up total station for taking observations
5.3 List the uses of total station
5.4 Explain the procedure for measurement of distances and angles
5.5 Explain procedure of taking multiple number of observations on a single station
5.6 Explain the procedure for measurement of area with single station setup
5.7 Explain the procedure of traversing using total station
5.8 Explain the orientation of total station by resection method
5.9 Explain establishing TBM by station elevation method
5.10 Explain Staking out a point, line and an arc
5.11 List the steps involved in marking the centre line for a typical residential building
5.12 Explain the procedure for LS and CS for proposed road / canal/ pipe line

COURSE CONTENT

1. Theodolite

1.1 Component parts, technical Terms, detailed study of a transit.
1.2 Fundamental lines and their relationship.
1.3 Temporary adjustments.
1.4 Measurement of horizontal angles by repetition and reiteration method.
1.5 Measurement of vertical angles.
1.6 Determination of magnetic bearings- deflection angles- direct angles- Prolonging a straight line.
1.7 Traversing with theodolite by included angle method, deflection angle method, bearing method.
1.8 Checks for closed and open traverse
1.9 Traverse computations, Latitude, departure, Errors in theodolite work.

2. Trigonometric levelling

2.1 Principle and necessity of Trigonometric levelling
2.2 Elevations and Distance of objects whose base is accessible and base is inaccessible with instruments station in same vertical plane and different vertical plane.

3. Tacheometry

3.1 Types and advantages of tacheometry-Stadia Tacheometry with staff held vertical and line of collimation horizontal or inclined – finding elevations and distances of staff stations – problems – determination of Tacheometric constants

4. Curves

4.1 Simple circular curve- definition and notations used - elements of simple curve

4.2 Preparation of curve table and setting out curves by chain and tape - single and double Theodolite methods – problems.

5. Total Station

5.1.Parts and functions – setting up total station for taking observations - Use of Total Station - Measurement of distances and angles - multiple number of observations on a single station - measurement of area with single station setup – Traversing using a total station - orientation of total station by resection method – establishing TBM by station elevation method – staking out a point, line and an arc – marking the centre line for a typical residential building - LS and CS for proposed road / canal / pipe line

REFERENCE BOOKS

1	Surveying I & II	by	B.C.Punmia
2	Surveying	by	S.K. Husain
3	Surveying and levelling I & II	by	T .P Kanetkar
4	Surveying - I & II –	by	A. V.R.J. Sharma and Kamala
5	Text book of surveying	by	C.venkatRamaiah
6	Surveying(McGrawhill)	by	N.N. Basak
7	Higher Surveying	by	A.M.Chandra (New Age Int.)

CONSTRUCTION MATERIALS

Subject Title : Construction Materials

Subject Code : C-305

Periods/Week : 04

Periods/Semester : 60

TIME SCHEDULEs

S.No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Stones	07	13	01	01
2.	Bricks	07	13	01	01
3.	Clay products & Sand	08	16	02	01
4.	Cement	07	13	01	01
5.	Mortars & Concrete	15	26	02	02
6.	Surface protective materials	04	06	02	00
7.	Timber, Plastics, Glass & Asbestos	12	23	01	02
	Total	60	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the selection of stones and their acceptability for construction work

1.1 Classify rocks (Physical classification only)
1.2 List the characteristics of good building stones.
1.3 List the common varieties of stones (like Granite, marble, Kadapa slabs, Shahabad stones)
1.4 Explain the purpose of dressing stones.

2.0 Understands the acceptability of bricks for construction work

2.0 State common sizes of bricks – IS specifications.
2.1 List the steps involved in the manufacture of bricks.
2.2 Explain the method of burning of clay bricks in a continuous kiln.
2.3 List the characteristics of good bricks.
2.4 List the standard tests on bricks
2.5 Explain the following tests conducted on bricks
1. Water absorption and 2. Compressive strength
2.6 Explain the uses of the following types of bricks for construction purposes - 1.Refractory bricks,
2. Fly ash bricks.

3.0 Understands the suitability of tiles, pipes and building sand for Construction

3.0 State the common varieties of tiles used for different purposes.
3.1 List the characteristics of good tiles.
3.2 List the uses of porcelain and glazed tiles.
3.3 State the uses of stone ware pipes.
3.4 List the characteristics of good sand.
3.5 State the functions of building sand.
3.6 State the percentage of bulkage allowance for construction work.
3.7 State the need for the quarry dust & robo sand as a substitute to sand.

4.0 Check the quality of cement for construction work

4.0 State the chemical composition of cement.
4.1 State rough and ready methods of examining cement
4.2 Explain the method of manufacture of cement by dry process only.
4.3 Types of cements
4.4 List the uses of various cements
4.5 State the standard tests for cement.
4.6 Explain the following tests on cement
1. Fineness,
2. Consistency,
3. Setting times.
4. Soundness
4.7 State grades of cement and their compressive strengths.
4.8 State the importance and application of blended cement with fly ash and blast furnace slag.

5.0 Understand the principles of preparation of mortars and Concrete

5.0 Explain 1.Fine aggregate and 2.Coarse aggregate.
5.1 Explain the purpose of water absorption and sieve analysis tests conducted on fine and coarse aggregates.(Procedure of tests not necessary).
5.2 Classify mortars.
5.3 List the different proportion of mortars for various works.
5.4 Explain the method of preparation of cement mortar .
5.5 List the ingredients of 1.Plain concrete and 2.Reinforced concrete.
5.6 State the usual proportions of plain and reinforced concrete for different items of work.
5.7 Define
1. Hydration of cement
2. Water cement ratio
3. Workability
4. Curing.
5.8 Explain the importance of 1.Hydration of cement and 2.water cement ratio.
5.9 States the types and uses of admixtures in concrete.
5.10 Explain the method of preparing concrete.
5.11 List the steps involved in the procedure of mixing, conveyance, placing, and compaction and curing of concrete.
5.12 List different curing compounds
5.13 List the methods of curing suitable for different surfaces.
5.14 Explain about ready mix concrete.

5.15 List the advantages and disadvantages of ready mix concrete.
5.16 List the uses of the following materials for improved durability and better resistance to adverse exposure conditions for concrete works
1. Fly ash,
2. Quarry dust

6.0 Understand the selections and applications of Surface Protective Materials

6.0 Give the composition of
1. Paints,
2. Enamels and
3. Varnishes.

6.1 List the types of the following surface protective materials:
1. Paints,
2. Enamels,
3. Varnishes,
4. Distempers,
5. Emulsion,
6. French polish and
7. Wax Polish.

6.2 List the uses of surface protective materials

7.0 Understand the selections and applications of Wood, Plastics, Glass and Asbestos for construction work

7.0 List the characteristics of good timber.
7.1 Define seasoning.
7.2 Explain the importance of seasoning of timber
7.3 Name the common varieties of timber used in A.P for various Civil Engineering works.
7.4 State various types of wood products used in construction work.
7.5 List the uses of wood products used in construction work.
7.6 List the uses of fibre reinforced plastic.
7.7 List merits and demerits of plastics.
7.8 List the merits and demerits of asbestos.
7.9 Explain suitability of different types of glasses as a building material.
7.10 List the uses of glass.

7.11 List the types of false ceiling materials
7.12 Understands the types and applications of Gypsum
7.13 State the Materials used for green buildings
7.14 State the applications of pre-painted G.I.sheets

COURSE CONTENT

1) Stones

a) Classification of rocks, physical classification.
b) Characteristics of good building stones.
c) Common varieties of stones-granite, marble, Kadapa slab, Shahabad stones.
d) Dressing of stones – purpose.

2) Bricks

a) ISI specification for bricks IS-1077-1971
b) Method of manufacture of bricks – continuous kiln process
c) Characteristics of good bricks.
d) Testing of bricks as per IS-3495-1966 – tests on water absorption and compressive strength of bricks.
e) Refractory bricks, Fly ash bricks and their uses.

3) Clay products & Sand

a) Tiles –Types of tiles- roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Morbonite.
b) Characteristics of good tiles.
c) Porcelain – glazed tiles (uses only).
d) Stone ware pipes – uses.
e) Characteristics of good sand, Functions of sand.
f) Bulking of sand – percentage of bulking – bulkage allowance to be permitted.
g) Quarry dust & robo sand as substitute of sand.

4) Cement

a) Chemical composition of cement.
b) Rough and ready method of testing cement.
c) Methods of manufacture of cement – Dry process.
d) Types of cement – Ordinary Portland cement, Portland Pozzolona Cement, Slag cement, quick setting cement, white cement –Rapid hardening cement – uses of different types of cement.
e) Tests for cement as per ISI – fineness, consistency, setting time, soundness tests – grads of cement and their compressive strengths.
f) Importance and application of blended cement with fly ash and blast furnace slag.

5) Mortars & Concrete

a) Fine aggregate and coarse aggregate – Purpose of Water absorption and sieve analysis tests conducted on fine and coarse aggregates.
b) Mortar – Classification of mortar – Lime mortar, cement mortar, Surkhi mortar, Blended mortar.
c) Different proportions of mortars for various works.
d) Method of Preparation of cement mortar.
e) Ingredients of plain concrete and reinforced concrete.
f) Proportioning – usual proportions of plain concrete and reinforced concrete for different items of work,
Foundation, Footings, Columns, Slabs & Beams for ordinary buildings.
g) Define - Hydration of cement, Water cement ratio, Workability, Curing - importance of Hydration of cement and water cement ratio .
h) Admixtures – types – Plasticizers, Super plasticizers, Air entraining agents Aceelartors, retarders – uses.
i) Method of preparation of concrete – Hand and machine mixing.
j) Procedure of mixing, conveyance, placing compaction, and curing of concrete.

k) Curing –different curing compounds - methods – suitability.
l) Introduction to ready mix concrete – Advantages and disadvantages.
m) List the uses of Fly ash and quarry dust for improved durability and better resistance to adverse exposure conditions for concrete works.

6) Surface Protective Materials

a) Composition of Paints, enamels, varnishes.
b) Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish.

7) Timber, Plastics, Glass and Asbestos

a) Characteristics of good timber.
b) Seasoning of timber – Importance.
c) Common varieties of timber used for different items of work – Doors and windows, form work, centering with particular references of A.P.
d) Wood products-veneer – Ply wood, particle board, laminated board, straw board – Eco board and their uses.
e) Types of plastics - merits and demerits of plastic – fibre reinforced plastics for plastic doors ,windows and water tanks.
f) Use of asbestos
g) Types of glasses and uses.
h) False ceiling materials- Types
i) Gypsum- Types –plaster of paris or stucco, gypsum plaster boards and partition walls (dry walls) – uses.
j) Materials used in construction of Green buildings
k) Pre-painted G.I.sheets- Applications.

REFERENCE BOOKS

1.	Building materials & components	By	C B R I
2.	Building materials	By	Kulakarni
3.	Construction materials	By	N.Sreenivasulu
4.	Building Materials	By	Duggal S. K
5.	Building Material & Construction	By	S.P. Arora & S. P. Bindra

CIVIL ENGINEERING DRAWING-I

Subject Title	**:**	**Civil Engineering Drawing - I**
Subject Code	**:**	**C-306**
Periods/Week	**:**	**06**
Periods/Semester	**:**	**90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Introduction	09	08	02	-
2.	Residential Buildings	42	29	01	01
3.	Public and Industrial Buildings	24	15	-	01
4.	Working drawings	15	08	02	-
	Total	**90**	**60**	**05**	**02**

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 25 + 15=40marks

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Applies standard practices in drawing different components of building

1.1 Sketches the conventional signs of various Civil Engineering materials, Plumbing and Electrical fixtures.
1.2 Draws the cross section of load bearing wall and Name all components below and above ground level.
1.3 Draws the plan of one Brick wall meeting at corner showing alternative courses of headers and stretchers in English Bond.
1.4 Draws the elevation and sectional plan of fully panelled door and labels the parts.
1.5 Draws the elevation and sectional plan of fully panelled window, glazed window and labels the parts.
1.6 Draws the elevation of king post and Queen post trusses and labels the parts with the given data(details of joints not required)

2.0 Understands the requirements of setbacks and orientation principles for planning residential buildings as per local bye laws and NBC (National Building Code)

2.1 Draws the site plan of a residential building as per local bye-laws.
2.2 Draws the plan, section and elevations of single storied load bearing residential buildings from the given line diagram and set of specifications. A) One room with veranda B) one bedroom house C) two bedroom house
2.3 Draws the plan, section and elevations of single storied framed structure residential buildings from the given line diagram and set of specifications. A) One bedroom house B) two bedroom house

2.4 Draws plan and section of a dog legged stair with given specifications.

2.5 Draws the plan of first and second floors, section and elevation of two-storied residential building (framed structure) from the given line diagram and set of specifications.

2.6 Prepares the drawings in the standard format for obtaining sanction from a local body for a residential building (two storied, two bedroom building) including a rainwater harvesting structure.

3.0 Draws the line diagram (to a scale) of public and Industrial Buildings

3.1 Rural hospital of 10 beds capacity

3.2 Hostel for 50 students

3.3 Primary school of 250 to 300 students

3.4 Apartments - plan of one floor with 6 to 10 units @ 90 –150 Sq.m/unit

4.0 Working drawings:

4.1 Prepares a working drawing for the purpose of marking the width of foundation for the given plan of a building.

4.2 Prepares the working drawings for electrical layout, for a given residential building (2 bedroom buildings – ground floor only)

4.3 Draws the plan and cross section of a lift shaft for a multi storied building.

4.4 Draw the typical layout of a active solar water heating system.

COURSE CONTENT:

1.0 Introduction

1.1 Conventional signs for materials like bricks, stone, concrete, wood, glass, earth, steel and electrical fixtures like ceiling fan, bulb, main switch, refrigerator, bell push, buzzer, A.C motor, and water supply and sanitary fixtures like tap, wash basin, sink, W.C pan (Indian and European type), shower, flush tank.

1.2 Cross section of a load bearing wall, showing all the components, below and above the ground level.

1.3 Plan of one brick wall meeting at a corner, showing Odd and even courses in English bond.

1.4 Elevation & sectional plan of a Fully panelled door ,showing the component parts.

1.5 Elevation & sectional plan of a Fully panelled window, glazed window, showing the component parts.

1.6 Elevation of King post and Queen post trusses with the given data, showing the component parts. (details of joints not required)

2.0 Residential Buildings:

2.1 Set backs and orientation principles for planning residential buildings as per local bye laws and NBC

2.2 Single storied two bedroom load bearing residential building

2.3 Single storied framed structure two bedroom residential building

2.4 Dog legged stair

2.5 Two-storied residential building (framed structure type)

2.6 The standard format for obtaining sanction from local body for a residential building (two storied, two bedroom building) including a rainwater harvesting structure.

3.0 Public and industrial buildings

Draw line diagrams only showing the functional requirements of

3.1 Rural hospital for 10 beds capacity
3.2 Hostel for 50 students
3.3 Primary school for 250 to 300 students
3.4 Apartments - Plan of one floor with 6 to 10 units @90 – 150 Sq.m/unit

4.0 Working drawings:

4.1 Working drawing for the purpose of marking the width of foundation for the given plan
4.2 The working drawings for electrical layout for a given residential building (two bedroom building – Ground floor only)
4.3 Lift shaft for multi storied building.
4.4 Active Solar water heating system.

REFERENCE BOOKS:

Civil Engineering Drawing - 1 By N. Srinivasulu

Civil Engineering Drawing - 1 By Chakraborthy

Civil Engineering Drawing - 1 By S. Mahaboob Basha

MATERIAL TESTING LABORATORY

Subject Title : **MATERIAL TESTING LABORATORY**
Subject Code : **C-307**
Periods/Week : **03**
Periods/Semester : **45**

TIME SCHEDULE

S. No.	Major Topics	No. Of Periods
1	Tests on Bricks	6
2	Tests on Cement	9
3	Tests on Aggregates	9
4	Tests on Metals	6
5	Tests on Concrete	6
6.	Tests on soils	9
Total		45

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the standard tests on Engineering Materials to find their suitability in construction

1.1 States the significance of tests on materials in the field.
1.2 States the apparatus/equipment required for the tests on materials.
1.3 Explains the procedure for conducting the test.
1.4 Performs the test on materials to assess the characteristics of the materials/ mechanical properties quantitatively.
1.5 Draws inferences from the test results on the suitability of these materials in Civil Engineering works.

2.0 Determine suitability of sample of cement for given conditions of workability and strength

2.1 States the significant of workability and Compression tests in field.
2.2 States the method of preparing sample and the number of samples required for given work.
2.3 States the apparatus required for the test.
2.4 Explains the procedure for conducting the test.
2.5 Performs test.
2.6 Record observations of test.
2.7 Draws inference from test results on workability/strength of concrete.

COURSE CONTENT:

1.0 Tests on Bricks

a)Water absorption, b) Crushing strength c) Efflorescence.

2.0 Tests on Cement

a) Fineness test
b) Normal consistency test
c) Initial and final setting times of cement.
d) Compressive strength of cement.

3.0 Tests on Aggregates

a) Water absorption of Sand

b) Bulking of Sand : i) Laboratory test & ii) Field test

c) Percentage of voids in Coarse and fine aggregates

d) Sieve analysis of coarse and fine aggregates

e) Field method to determine fine silt in fine aggregate

f) Aggregate impact value for coarse aggregate

g) Specific gravity of fine and coarse aggregates

h) Bulk density of coarse aggregate and fine aggregates.

4.0 Tests on Metals

a) Tension test on steel rod
b) Deflection Test on beam (Steel beam or wooden beam)

5.0 Tests on Concrete

a) Slump cone test.
b) Compressive strength –cube test.

6.0 Tests on soils

a) Liquid limit & plastic limit
b) Standard Proctor test for OMC & MDD
c) Field density by sand replacement and core cutter method.

SURVEYING – II PRACTICE & PLOTTING

Subject Title : Surveying – II Practice & Plotting
Subject Code : C-308
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Theodolite Surveying	12
2.	Trigonometric levelling	08
3.	Tacheometry	08
4.	Curves	06
5.	Total Station	26
	Total	**60**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Performs Theodolite Surveying

1.1 Performs temporary adjustment.
1.2 Measures horizontal angles and vertical angles
1.3 Records the observations in the field book.
1.4 Determines of inaccessible horizontal distance involving two Instrument stations.

2.0 Performs Trigonometric levelling

2.1 Determines horizontal and vertical distances of accessible and inaccessible objects by using a Theodolite.

3.0 Performs Tacheometric Surveying

3.1 Takes Tacheometric observations.
3.2 Determines constants of a given Tachometer in the field
3.3 Computes heights and distances from field observations.

4.0 Sets out Simple Curves is the Field

4.1 Computes the elements of curve.
4.2 Sets out simple curve by chain and tape.

5.0 Field Exercises using Total Station

5.1 Study of component parts, accessories and functions Total Station.
5.2 Initialization of Total Station over ground station and measure the distance between two given points.
5.3 Measure area of given field.

5.4 Conduct traversing survey (closed Traverse).
5.5 To find Height and width of an elevated object.
5.6 To determine the elevation of Instrument point by making observation to point with known elevation.
5.7 To measure multiple sets (rounds) of observations.
5.8 To perform a station setup on a known point by making observations to one or more back sight points.
5.9 To establish the position of an occupied point relative to a base line or a boundary line.
5.10 To mark or establish points, Lines and Arcs on the ground.
5.11 To mark Centre line of a building on the ground.
5.12 L.S and C.S of proposed road/canal/pipe line on the ground.
5.13 Understand post processing.
5.14 To plot contour map of an area using surfer software.

COURSE CONTENT:

1.0 Theodolite surveying

1.1 Study of transit Theodolite- Temporary adjustments of Theodolite.
1.2 Measurement of horizontal angles by reiteration and repetition method.
1.3 Measurement of vertical angles.
1.4 Determination of inaccessible horizontal distance involving two Instrument stations.

2.0 Trigonometric levelling

2.1 Determination of height and reduced level of the top and bottom of accessible object.

3.0 Tacheometry

3.1 Determination of constants of Tacheometry.
3.2 Determination of horizontal distance and elevation by Stadia Tacheometry.

4.0 Curves

4.1 Setting out a simple curve by chain and tape method.

5.0 Field Exercises using Total Station.

5.1 Study of the Total Station equipment.
5.2 Station setup and measuring distance.
5.3 Measurement of area.
5.4 Traversing with total station.
5.5 Height and width of the elevated object.
5.6 Orientation of Total Station by resection method.
5.7 Establishing T.B.M by Station Elevation Method.
5.8 Measure rounds (multiple sets of observations on a single station).
5.9 Establish the position of an occupied point relative to a base line or a boundary

line.

5.10 Staking out a point, line and an arc.

5.11 Marking of the centre line for proposed residential building.

5.12L.S and C.S of a proposed road/Canal/pipeline.

5.13 Post processing.

5.14 Contouring.

HYDRAULICS LABORATORY

Subject Title : Hydraulics Laboratory
Subject Code : C-309
Periods/Week : 03
Periods/Semester : 45

TIME SCHEDULE

S.No	Major Topics	No. of Periods
1.	Verification of Hydraulic Principles/ Laws	36
2.	Study of Hydraulic machines	09
	Total	**45**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Verifies Hydraulic Principles

1.1 States the principle / law
1.2 States the apparatus / equipment required for testing the principle.
1.3 Performs test and records observations.
1.4 Draws inferences on the relationship between parameters.

2.0 Study of Hydraulic machines.

2.0 Understands the principles of Hydraulic machines.
2.1 Studies the functioning of Pumps and Turbines.

COURSE CONTENT:

LIST OF EXPERIMENTS:

1.0 Verifies Hydraulic Principles:

1 Determination of coefficient of discharge of a small orifice by constant head method and variable Head Method
2 Determination of Cc of an orifice by finding C_v and C_d.
3 Determination of coefficient of discharge of a mouthpiece by constant head method.
4 Determination of coefficient of discharge of triangular, rectangular and trapezoidal notches.
5 Verification of Bernoulli's theorem.
6 Determination of coefficient of a discharge of a venturimeter.
7 Determination of the coefficients of friction of pipe flow.
8 Determination of Chezy's constant from flow through open channel.

2.0 Study of Hydraulic Machines

9 Study of reciprocating pump and centrifugal pump.
10 Study of turbines – Pelton wheel, Francis and Kaplan turbines.

IV SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

IV SEMESTER

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-401	Reinforced Concrete Structures	6	-	90	3	20	80	100
C-402	Irrigation Engineering	4	-	60	3	20	80	100
C-403	Quantity Surveying	6	-	90	3	20	80	100
C-404	Transportation Engineering	5	-	75	3	20	80	100
C-405	Construction Practice	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-406	Civil Engineering Drawing-II	-	4	60	3	40	60	100
C-407	CAD Practice - I	-	6	90	3	40	60	100
C-408	Communication skills	-	3	45	3	40	60	100
C-409	Building Construction Practices	-	4	60	3	40	60	100
	Total	**25**	**17**	**630**	**-**	**260**	**640**	**900**

REINFORCED CONCRETE STRUCTURES

Subject Title : REINFORCED CONCRETE STRUCTURES
Subject Code : C- 401
Periods/Week : 06
Periods/Semester : 90

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weight age of Marks	Short Type	Essay Type
1	Introduction to R.C.C and Principles of Working Stress Method	10	13	1	1
2	Philosophy of Limit State Design	04	03	1	-
3	Analysis and Design of Rectangular Beams	20	26	2	2
4	Design of Slabs	14	16	2	1
5	Analysis of T-beams	11	13	1	1
6	Design of continuous slabs and beams	12	16	2	1
7	Design of columns	11	13	1	1
8	Design of footings	08	10	-	1
	Total	**90**	**110**	**10**	**8**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the Properties of materials used in R.C.C, Loads to be considered and principles of working stress design

1.1 Introduction to Concrete and R.C.C
1.2 State the following properties of concrete: Compressive strength, Tensile strength, Modulus of elasticity, Poisson's ratio, Shrinkage, Creep, Workability and Unit weight.
1.3 Explains and differentiate between 'Nominal Mix Concrete' and 'Design Mix Concrete'
1.4 State the reasons for using steel as reinforcement.
1.5 Explain the functions of reinforcing steel in R.C.C members. State the types of steel used in R.C.C construction.
1.6 Define modulus of elasticity of steel and unit weight of steel.
1.7 Loads to be adopted in R.C.C design – dead load, live load, wind load (as per IS 875-1987), earth quake loads (as per IS-1893), snow load etc.,
1.8 Introduction to I.S Codes and state the different methods of designing R.C elements.
1.9 Explain the basic concept of working stress design, assumptions in the design, and permissible stresses in the materials.
1.10 Define Modular ratio, Effective depth, Neutral axis, Lever arm and Moment of resistance
1.11 Balance, under reinforced, over reinforced sections
1.12 Calculates the neutral axis, lever arm and moment of resistance of singly reinforced rectangular beam.
1.13 Design of singly reinforced rectangular beam in flexure.

2.0 Introduction to Limit state Design

2.1 Introduction to Limit state design, its philosophy and IS:456 – 2000 code provisions.
2.2 Define Limit State and state different limit states.
2.3 Distinguish *'strength'* and *'service ability'* limit states
2.4 Defines the *'characteristic strength'* of materials and *'characteristic loads'*
2.5 Explains the role of partial safety factors in limit state design.
2.6 Defines 'Design strength of materials' and *'Design loads'*
2.7 States the assumptions made in the limit, state design.
2.8 State the differences between the working stress method and limit state method of design of R.C elements

3.0 Understands the principles of analysis and design of singly reinforced and doubly reinforced R.C.C rectangular beams, by limit state method.

3.1 Calculate the maximum depth of neutral axis, lever arm and moment of resistances for singly reinforced beams. Moment of resistance of doubly reinforced rectangular beams. Also calculate the allowable working load for the given span.
3.2 Calculates the nominal shear stress, shear resisted by bent up bars and spacing of vertical stirrups. Design of shear reinforcement for beams.
3.3 Calculates the development length of bars in compression, tension, and the curtailment position for main tension bars. State the importance of anchorage values of reinforcement.
3.4 Design a singly / doubly reinforced simply supported rectangular beams for the given grades of materials, span and loading, for flexure including shear design with the curtailment of reinforcements and check for the deflection using simplified approach of the code.
3.5 Design an independent lintel subjected to triangular loading.

4.0 Understands the principles involved in the design of R.C.C slabs by Limit state method.

4.1 Distinguish between one-way slabs and two way slabs.
4.2 Design one-way slab for given grades of materials, loads and span for flexure and including shear design. Check for deflection using stiffness criteria.
4.3 Understand Load distribution in two-way slabs. Design two-way slabs with different end conditions for flexure including shear using B.M coefficients. Provision of torsional reinforcement in the restrained slabs. Check the deflection using simplified approach of stiffness criteria.
4.4 Sketch the detailing of reinforcement in stairs spanning longitudinally (Dog legged staircase only)

5.0 Understands the principles involved in the analysis of T-beams

5.1 List the advantages of T-beam.
5.2 Write the formula for effective width of flange of a T-beam as per IS 456-2000.
5.3 Describe the three cases of T-beams with sketches and notations.
5.4 Calculate the moment of resistance of the given Tee section using the expressions given in the code.

6.0 Understands the principles involved in the design of Continuous beams and slabs

6.1 Explains the behaviour of continuous beams and slabs subjected to loading and advantages of continuous beams and slabs.
6.2 Calculates the B.M and S.F of continuous beams and slabs (Minimum of three spans) at critical sections using B.M and S.F coefficients given in the code.

6.3 Design the tension reinforcement at a given section only

7.0 Understands Analysis and Design of columns

7.1 Defines column and understands its behaviour under loading.
7.2 Code provisions of columns
7.3 Differentiates between short and long columns and Understand their failure behaviour.
7.4 Determine load carrying capacity of a given axially loaded short column.
7.5 Designs a Short Square, rectangular, circular column with lateral ties (subjected to axial load only).

8.0 Understands Design of Footings

8.1 Defines Footing and State different types of Footings (Square/Rectangular Isolated footings of Uniform/Tapered sections).
8.2 Explains the code provisions for the design of R.C.C footings.
8.3 Design the isolated square footing of uniform thickness for an axially loaded square column.
8.4 Checking of the footing for one-way shear, two-way shear, bearing stress and for development length.

Note: Students may be encouraged to use design aid SP-16, SP-34 and SP-23 for design of slabs, beams for general practice. I.S.456 – 2000 is allowed in the Examination.

COURSE CONTENTS:

1.0 Introduction to R.C.C and Principles of working stress design

1.1 Introduction to R.C.C, Loads to be considered and Introduction to I.S Codes and Assumptions in working stress method.
1.2 Characteristic compressive strength, modulus of elasticity of concrete.
1.3 Loads to be adopted in R.C.C. design – dead load, Live load, wind load(as per IS 875-1987) and earth quake loads(as per IS-1893).
1.4 Nominal Mix – Design Mix – differences.
1.5 Modular ratio – critical percentage of steel.
1.6 Balance, under reinforced, over reinforced sections.
1.7 Critical and actual neutral axis depth of singly reinforced beams.
1.8 Moment of resistance of simply supported singly reinforced beam sections.
1.9 Design of singly reinforced rectangular beam for flexure.

2.0 Philosophy of limit state Design

2.1 Introduction to Limit state design – philosophy – Limit state – Types of Limit states.
2.2 Strength and serviceability limit states, characteristic strength of materials and characteristic loads and partial safety factors.
2.3 Design strength of materials and design loads.
2.4 Assumptions made in the limit state design.

3.0 Analysis and design of Rectangular beams

3.1 Stress-strain diagram of singly reinforced RCC beam.
3.2 Depth of neutral axis, lever arm.
3.3 Moment of resistance of singly reinforced Rectangular section – balanced, under reinforced.
3.4 Critical percentage of steel.

3.5 Calculation of moment of resistance of the given section and design of singly reinforced rectangular beam for the given load as per IS 456-2000.

3.6 Doubly reinforced sections - necessity, use.

3.7 Calculation of neutral axis and moment of resistance for the given section and grades of concrete and steel (no derivation of the equations).

3.8 Shear in singly reinforced beams - nominal shears stress - permissible shear stress.

3.9 Methods of providing shear reinforcement in the form of vertical stirrups - combination of vertical stirrups and bent up bars.

3.10 Code provisions for spacing of stirrups and minimum shear reinforcement (no derivation of equations).

3.11 Development of bond stress in reinforcing bars.

3.12 Design bond stress - development length – bond and anchorage concepts and their importance.

3.13 Curtailment of tension reinforcement.

3.14 Simple problems on development length.

3.15 Design of simply supported singly and doubly reinforced rectangular beam for flexure including shear and check for deflection using stiffness criteria - Use of design aids (SP-16).

3.16 Design of an independent lintel subjected to triangular loading.

4.0 Design of slabs

4.1 Slabs as structural and functional members

4.2 One way and two way slabs

4.3 Minimum reinforcement and maximum spacing of reinforcement – concrete cover - stiffness criterion-stiffness ratios for simply supported, cantilever and continuous slabs.

4.4 One way and two way slabs with various end conditions as per I.S:456 code.

4.5 Design of one-way slab for flexure and shear for the given grades of concrete, steel, span and loading.

4.6 Check for deflection using simplified approach of stiffness criteria.

4.7 Design of two-way slabs with different end conditions, using B.M coefficients for the unrestrained and restrained conditions as per code.

4.8 Design of torsion reinforcement for the restrained slabs - Deflection check using stiffness criteria - Use of design aids (SP-16).

4.9 Detailing of reinforcement in stairs spanning longitudinally.

5.0 Analysis of T-beam

5.1 Conditions needed for design of a beam as T-Section–advantages - Code provisions for effective flange width - three cases of T- beams.

5.2 Neutral axis, lever arm and moment of resistance for under reinforced, balanced sections using the equations given in the code (no derivations).

5.3 Calculation of the moment of resistance of tee section using the equations given in the code – Use of design aids (SP16).

6.0 Design of Continuous beams and Slabs

6.1 Behaviour of continuous members and advantages of continuous beams and slabs.

6.2 Determination of B.M and S.F of continuous beams and slabs of minimum three spans using BM & SF coefficients given in the code-Use of design aids (SP-16).

6.3 Design the tension reinforcement at a given section only.

7.0. Design of columns

7.1 Definition of column – Difference between Column and Pedestal.

7.2 Types of columns (Long and Short) - effective length for different end conditions.

7.3 Code provisions for design of columns- square, rectangular and circular columns with lateral ties

7.4 Determination of Load carrying capacity of short column (subject to axial load only).

7.5 Design of short square, rectangular and circular columns (with lateral ties only).

8.0 Design of Footings

8.1 Footings - Need for footings

8.2 Footings under isolated columns – loads on footings

8.3 Code provisions for design of footings - size of footings for given bearing capacity

8.4 Design of an isolated square footing of uniform thickness under a column

8.5 Checking of the footing for one-way shear, two-way shear, bearing stress and for development length.

REFERENCE BOOKS

1. *'Limit state design of R.C.C structures'* by Ashok K.Jain, Nem chand brothers, Roorkee.

2. 'Limit state Design of concrete structural elements', continuing Education module prepared by N.I.T.T.T.R Chennai and published by I.ST.E continuing education cell, university Visveswaraiah College of Engineering, (UVCE)Campus, Palare Road, Bangalore – 560001.

3. Structural Engineering(RCC) by Ramamrutham.

4. Structural Engineering (RCC) by Vazirani and Ratwani.

5 R.C.C Structural Engineering by Guru charan Singh.

6 Reinforced Concrete Structures by I.C.Syal and A.K.Goyal

7 Limit state design of reinforced concrete by P.C. Verghese

8 Concrete technology and practice by M.S Shetty

9 SP:34 - Handbook on concrete reinforcement and detailing.

10 Structural Design & Drawing by N. Krishna Raju (Universities press)

IRRIGATION ENGINEERING

Subject Title : Irrigation Engineering

Subject Code : C-402
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Nature and scope of Irrigation Engineering	07	13	01	01
2.	Elements of Hydrology	07	13	01	01
3.	Head works	07	13	01	01
4.	Gravity dams and Earth dams	13	23	01	02
5.	Distribution works	08	16	02	01
6.	Soil Erosion, Water logging and River Training works	07	13	01	01
7.	Water Management	04	06	02	--
8.	Watershed Management	07	13	01	01
	Total	60	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the Nature and scope of Irrigation

1.1 Define Irrigation
1.2 Understand the necessity of irrigation.
1.3 List advantages of irrigation.
1.4 List disadvantages of irrigation
1.5 State different types of irrigation
1.6 Explain Perennial Irrigation
1.7 Explain Inundation Irrigation
1.8 Distinguish between
   1. Perennial and inundation irrigation,
   2. Flow and Lift irrigation, and
   3. Storage and Direct irrigation.
1.9 State Principal crops in India and their seasons
1.10 Explain Kharif crops
1.11 Explain Rabi Crops
1.12 Define the following terms:

1. Duty,
2. Delta,
3. Base period and
4. Crop period

1.13 Explain different methods of expressing duty
1.14 State the relationship between duty and delta and base period
1.15 Explain the factors affecting duty
1.16 State the requirement for precise statement of duty
1.17 State the duty figures for principal crops
1.18 Solve simple problems on duty

2.0 Understands the basic concepts of Hydrology

2.1 Explain the term Precipitation
2.2 State different types of rain gauges
2.3 Describe Simon's rain gauge
2.4 Explain the method of measurement of rainfall using Simon's Rain gauge
2.5 Explain the method of measurement of rainfall using float type automatic rain gauge
2.6 Explain precautions in setting and maintenance of rain gauges
2.7 State uses of rain fall records
2.8 Describe Hydrological cycle
2.9 Explain method of average annual rainfall of an area by Theisson's Polygon method
2.10 Solve the problem on calculation of average annual rainfall by Theisson's Polygon method
2.11 Define the following:
1. Catchment,
2. Intercepted catchment,
3. Free catchment and
3. Combined catchment area
2.12 State the characteristics of
1. Good catchment,
2. Average catchment and
3 .Bad catchment
2.13 Explain the term Run-off
2.14 Explain factors affecting runoff
2.15 Understand nature of catchment and runoff coefficient
2.16 Explain methods of estimating runoff using empirical formulae
2.17 Solve the problems on estimating run-off
2.18 Understand the term maximum flood discharge
2.19 Explain the methods of determining maximum flood discharge
2.20 State Ryve's and Dicken's Formulae
2.21 Solve simple problems on estimating maximum flood discharge
2.22 Explain the importance of river gauging
2.23 Lists the factors for selecting suitable site for a gauging station

3.0 Understands the head works for a diversion scheme and protective works for resisting percolation

3.1 Classify head works
3.2 State the suitability of different types of head works under different conditions
3.3 State the factors for selecting suitable site for diversion head works
3.4 Describe the component parts of Diversion works with sketch
3.5 Describe with sketch the component parts of a weir
3.6 Distinguish between barrage and Weir
3.7 Describe head regulator with sketch
3.8 Describe scouring sluice with sketch
3.9 Describe flood banks and other protective works
3.10 Define the following terms:
1. Percolation,
2. Percolation gradient,
3. Uplift and
4.Scour.
3.11 Explain percolation gradient
3.12 Explain uplift pressure

4.0 Understands the basic ideas about reservoirs, gravity dams and Earth dams

4.1 Distinguish between Rigid dams and Non-rigid dams
4.2 State factors influencing selection of site for reservoirs and dams.
4.3 Define the terms:
1. Full reservoir level,
2. Maximum water level,
3. Top bund level,
4. Dead storage,
5. Live storage,
6. Free board,
7. Gravity dam and
8. Spillway.
4.4 Explain the causes of failure of gravity dams and their remedies.
4.5 Distinguish between low and high dams.
4.6 Draw the elementary profile of a gravity dam for a given height
4.7 Draw the practical profile of a low dam.
4.8 Explain uplift pressure
4.9 Explain need for drainage galleries with sketches
4.10 Explain construction and contraction joints with sketches
4.11 State need and types of grouting of foundations
4.12 State different types of spillways and their suitability and draw sketches
4.13 State the situations in which earth dams are suitable
4.14 State the three types of earth dams with sketches of typical cross sections
4.15 Explain causes of failure of earthen dams and their precautions
4.16 Explain the terms with sketches
1. Saturation gradient and

2. Phreatic line

4.17 Explain drainage arrangements in earth dams with a neat sketch

4.18 State the method of constructing rolled fill earth dams and their maintenance.

4.19 Explain breach filling in earthen dams

4.20 Explain the maintenance of earth dams

5.0 Understands the basic ideas about canals & cross masonry works

5.1 Classify canals.

5.2 State the different methods of canal alignment and the situations in which each is suitable.

5.3 Sketch typical cross sections of canals

1. In cutting,
2. Embankment and
3. Partial cutting.

5.4 Explain balanced depth of cutting and its necessity

5.5 State the need for canal lining

5.6 State advantages of canal linings

5.7 State disadvantages of canal linings

5.8 Explain different types of canal linings

5.9 Explain the maintenance required for canals and their regulation

5.10 State different types of cross masonry works (cross regulator, drainage & Communication) and their objectives.

5.11 State need for cross drainage works

5.12 Describe the following with sketches

1. Aqueduct,
2. Super passage,
3. Under tunnel, siphon,
4. Level crossing and
5. Inlet and outlet

6.0 Understands the soil erosion, water logging and River training works

6.1 Explain terms:

1. Soil erosion,
2. Reclamation, and
3. Water logging.

6.2 State causes of soil erosion

6.3 State ill effects of soil erosion

6.4 Explain various methods of prevention of soil erosion.

6.5 State causes of water logging

6.3 State ill effects of water logging

6.4 Explain various methods of prevention of water logging

6.5 State methods of land reclamation.

6.6 State different stages of flow of rivers

6.7 Explain characteristics of Delta Rivers

6.8 Explain term meandering of river

6.9 State objectives of river training works

7.0 Understands the principles of water management

7.1 State soil-water plant relationship.
7.2 Describe the following irrigation methods:
1. Broader irrigation,
2. Check basin irrigation,
3. Furrow irrigation,
4. Sprinkler irrigation and
5. Drip irrigation
7.3 Explain on farm development
7.4 Describe 1. Warabandi system and 2. Water user associations
7.5 State the duties of water user associations

8.0 Understands the basic ideas about watershed management

8.1 Explain the concept of
1. Water shed and
2. Water shed management
8.2 State the need for watershed management
8.3 List the objectives of watershed management
8.4 State need for watershed development in India
8.5 Describe different approaches to water shed management
8.6 Explain the methods of Rain water harvesting
8.7 Explain method water harvesting through check dams
8.8 Explain different methods of artificial recharge of ground water
8.9 Explain artificial recharges of ground water using percolation tanks

COURSE CONTENT

1. Nature and scope of Irrigation Engineering

a) Definitions-necessity of irrigation-advantages and disadvantages-Perennial and Inundation irrigation-Flow and Lift irrigation-Direct and Storage irrigation.

b) Principal crops-Kharif and Rabi crops-Dry and wet crops.

c) Definition of duty, delta, base period, and crop period, Duty-different methods of expressing duty-base period-relationship between duty and delta and base period - factors affecting duty – Requirements for precise statement of duty - Duty figures for principal crops-simple problems on duty.

2. Elements of Hydrology

a) Precipitation – Types of rain gauges – Simon's rain gauge - Float type automatic recording gauge – precautions in setting and maintenance – rain fall records – Hydrological cycle-average annual rainfall of an area –
Theissen's polygon method.

b) Catchment basin in catchment area - Free catchment - combined catchment - Intercepted catchment – Run- off - Factors affecting run-off -
Nature of catchment, run off coefficient - Methods of estimating run off

Empirical formulae -Maximum flood discharge - Methods of determining maximum flood discharge, Ryve's and Dicken's formulae,– Simple problems on M.F.D.

c) River gauging – Importance – Site selection for river gauging

3. Head Works

a) Classification of head works-storage and diversion, head works - their suitability under different conditions-suitable site for diversion works - general layout of diversion works-brief description of component parts of diversion works, brief description of component parts of a weir.

b) Barrages and Weirs.

c) Head Regulator-scouring sluice-flood banks and other protective works.

d) Percolation-Percolation gradient-uplift pressures.

4. Gravity dams and Earth dams

a) Dams-rigid and non-rigid dams - main gravity dams-failures of gravity dams and remedial measures - elementary profile – limiting height of dam-low dam and high dam - free board and top width – Practical profiles of low dam - uplift pressure - drainage gallery - Contraction joints - grouting of foundations - spillways

b) Earth dams – situations suitable for Earth Dams types of earth dams-causes of failure of earth dams and precautions –saturation gradient and phreatic line-drainage arrangements-construction details of earth dams-breaching sections-breach filling-maintenance of earth dams.

5. Distribution works

a) Canals-classification-different methods of canal alignment-typical cross section of canal in cutting embankment, partial cutting and embankment – Berms - standard dimensions - balancing depth of cutting-canal lining-necessity - types –maintenance of canals.

b) Cross drainage works - Necessity – General description of aqueducts – Super passage – under tunnel - siphon level crossing- Inlet and outlet.

6. Soil erosion, Water logging and River Training works

a) Soil erosion-methods of prevention of soil erosion-causes and effects- of water logging-preventing water logging methods-land reclamation.

b) Different stages of flow of rivers-characteristics of Delta Rivers - Meandering - Object of river training - River training works.

7. Water management

Soil-water plant relationship-Irrigation methods-Broader Irrigation, check basin irrigation-Furrow Irrigation-Sprinkler irrigation-Drip irrigation – farm development, water user associations & Warabandi system.

8. Watershed Management

a) Introduction - Concept of Watershed Management – Objectives of watershed Management – Need for watershed development in India – Integrated and multidisciplinary approach for water shed management.
b) Rainwater water harvesting – Soil moisture conservation – Check dams – Artificial recharges and percolation tanks.

REFERENCE BOOKS

1. Irrigation Engineering by B.C Punmia
2. Irrigation Engineering and Water power Engineering by Birdie.
3. Irrigation Engineering by S.K.Garg
4. Irrigation Engineering by Basak-TMH

QUANTITY SURVEYING

Subject Title : Quantity Surveying
Subject Code : C-403
Periods/Week : 06
Periods/Year : 90

TIME SCHEDULE

Sl. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Introduction, units and specification	05	06	2	-
2	Detailed Estimates of Buildings	28	26	2	2
3	Analysis of rates and Abstract Estimates	17	23	1	2
4	Estimation of quantity of Steel of R.C.C elements	05	03	1	-
5	Earth work calculations	08	13	1	1
6	Detailed estimates of roads, culverts, open well and Public health Engineering works	17	23	1	2
7	Valuation of buildings –principles and methods of Valuation	08	13	1	1
8	Rent fixation of buildings	02	03	1	-
	TOTAL	**90**	**110**	**10**	**08**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand basic concepts of Quantity Surveying, Units and Specifications

1.1 Define:
   a) Quantity Surveying
   b) Estimation
1.2 State the need for quantity surveying and duties of Quantity Surveyor.
1.3 Distinguish among element of structure, item of a work & materials of construction
1.4 State the units of measurements, data and payment for different items of work and materials using I S : 1200
1.5 States the process of taking measurements for different works and tolerances
1.6 Gives the general specifications for important items of work
1.7 States different types of estimates.
1.8 Prepares approximate estimates for residential and non – residential buildings with given data of size/capacity and rates considering cost of building Services and other over heads.

2. Prepares detailed estimates for various Civil Engineering Structures

2.1 States the information required for preparation of detailed estimate of a building

2.2 Prepares the detailed estimate for various buildings from the given drawings specifications and site conditions.

2.2.1 Compound wall and steps.

2.2.2 One roomed building with verandah (load bearing type)

2.2.3 One/Two bed room building (load bearing type)

2.3 Prepares the estimation of a Steel Roof Truss for an Industrial Building with sloped roof.

3. Understands the Analysis of Rates and Abstract estimations

3.1 Defines different terms involved in rate analysis

3.2 Explains the computation of rate of an item of work

3.3 Prepares Lead Statement and data for different items of work

3.4 Tabulates the material requirements of mortars and concrete of different proportions

3.5 State different items involved in abstract estimate of the following

3.5.1 One roomed building with verandah

3.5.2 One/Two bed room building

4 Prepares the estimates for steel reinforcement for different R.C.C elements

4.1 States the different methods of estimation of steel required for R C C work involved in a building

4.2 Computes the quantity of steel reinforcement for a simply supported singly reinforced R.C.C beam in building by preparing a bar bending schedule using HYSD bars only.

5. Computes the volumes of earth work and reservoir capacity

5.1 States the different methods of computations of areas and volumes

5.2 Defines the lead and lift and states the standard values

5.3 Prepares a detailed estimate for volume of earth work for roads, canals and earthen bunds.

5.4 Computes gross and effective capacity of a reservoir from the areas of different elevations

6. Prepares the detailed estimates of irrigation and public health engineering structures

6.1 Prepares detailed estimates of different types of roads & culverts.

6.2 Prepares a detailed estimate for open well, R.C.C. overhead tank, Septic tank with soak pit / dispersion trench.

6.3 States the different items involved in the abstract estimates of the above structures.

7. Understands valuation of buildings

7.1 Explains terms: Valuation, Scrap value, salvage value, market value, book value, sinking fund, depreciation.
7.2 States the purpose of valuation.
7.3 States the factors governing valuation.
7.4 Calculates depreciation of a building.
7.5 Determines value of a building

8. Understands rent fixation of building

8.1 Determines rent for a building on plinth area method.

COURSE CONTENT

1. Introduction of Unit measurements and Specifications

1.1 Definition of quantity surveying/estimation –need for estimation –duties of Quantity Surveyor
1.2 Various items of Civil Engineering works as per I.S: 1200 and their Units of measurement.
1.3 Rules for measurement.
1.4 General specifications for different items of work
1.5 Define: Detailed Estimate – Abstract Estimates - Working estimates – Revised estimates – Supplementary estimates - Formats for detailed and abstract estimates.
1.6 Preliminary or Approximate Estimate – Plinth area estimate – Cubic rate Estimate methods
1.7 Problems in Preliminary estimate for residential and non-residential buildings (Plinth area method).

2 Detailed Estimates of Buildings

2.1 Detailed estimate for a Compound wall and steps
2.2 One roomed building with verandah (load bearing type structure)
2.3 One/Two bed room building (load bearing type structure)
2.4 Estimate for a sloped roof.

3 Analysis of Rates and Abstract Estimates

3.1 Define - rate analysis, standard data book, standard schedule of rates , standard data sheet, blasting charges, seinorage charges, cess charges, stacking charges, water charges, crushing charges, lead charges – purpose of analysis of rates.
3.2 Cost of materials at source and at site.
3.3 Computation of rate of an item of work - Cost of labour-Types of labour-Schedule of rates.
3.4 Prepare Lead statement and Data sheet for different items - materials required for mortars and concrete of different proportions
3.5 Abstract Estimate for
3.5.1 One roomed building with verandah.

3.5.2 One/Two bed room building.

4 Estimation of quantities of steel of R.C.C elements

4.1 Simply supported singly reinforced R.C.C beam.
4.2 Preparation of bar bending schedule for above using HYSD bars only

5 Earth work Calculations

5.1 Trapezoidal-Prismoidal-Mid-ordinate –mean sectional area rules for computing volumes in level sections for roads and canals.
5.2 Leads and Lifts and their standard values
5.3 Taking out quantities from L.S and C.S in cutting and embankment of level Sections.
5.4 Capacity of reservoirs from contours maps

6 Detailed Estimates of Roads, Culverts, Open well and public health Engineering Works

6.1 Water bound macadam road
6.2 Road with Bitumen Surface dressing
6.3 Cement concrete road
6.4 R.C.C slab culvert with straight returns.
6.5 Open well with masonry steining
6.6 R.C.C Overhead Water tank.
6.7 Septic tank with dispersion trench/soak pit.
6.8 Different items to be included in the abstract estimates of the above structures.

7. Basic Principles of Valuation

7.1 Define: Scrap value, salvage value, market value, book value, sinking fund, depreciation.
7.2 Definition and purpose of valuation.
7.3 Factors governing valuation-Life of structure, type location maintenance, legal control
7.4 Calculation of depreciation by different methods.
7.5 Methods of valuation.

8. Rent fixation of Buildings

8.1 Rental value based on plinth area method.

REFERENCE

1.	Estimating and Costing	by	B N Datta
2.	Estimating	by	Gurucharan Singh
3.	Estimating and Costing	by	S.C. Rangwala
4.	Quantity Surveying	by	A. Kamala
5.	Civil Engg Contracts & Estimates	by	B.S. Patil (Universities press)

TRANSPORTATION ENGINEERING

Subject Title : Transportation Engineering

Subject Code : C-404

Periods/Week : 05

Periods/Semester : 75

TIME SCHEDULE

S. No	Major Topics	No of periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to Highways	14	16	02	01
2	Highway Surveys and Traffic Engineering	12	23	01	02
3	Highway Constructions and Maintenances	14	23	01	02
4	Introduction and Permanent way of Railways	12	13	01	01
5	Station yards and Maintenance of Railways	08	16	02	01
6	Bridges, Culverts and Cause ways	15	19	03	01
	Total	75	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to understand

1.0 Introduction to Highways

1.1 States the importance of transportation engineering.
1.2 States the importance and functions of I.R.C
1.3 States the classification of roads as per I.R.C
1.4 Explains the components of a road C/S with a sketch.
1.5 Defines the terms: width of pavement, shoulder, formation width, right of way, camber, gradient, ruling gradient, super elevation, sight distance.
1.6 States the necessity of providing super elevation and gives formula.
1.7 States the necessity of curves in highways.
1.8 States the different horizontal and vertical curves adopted in roads.

2.0 Understands Highway Survey and Traffic Engineering

2.1 Defines the term alignment.
2.2 States the factors influencing selection of alignment for a road in plain and hilly areas.
2.3 Lists the surveys required for fixing alignment.
2.4 States the different data required for the preparation of highway project.
2.5 States the importance of traffic census.
2.6 Explains with neat sketches traffic islands and Interchanges.
2.7 States the functions and types of pavement markings with sketches.
2.8 States the purposes and types of traffic signs with sketches.

3.0 Understands Highway construction and Maintenance

3.1 States the necessity of road drainage.

3.2 Explains the methods of providing surface and sub-surface drainage.

3.3 Explains the methods of construction of different types of roads.

3.4 Explains the maintenance of different types of roads.

3.5 States the materials used in construction of different types of roads, Granular Sub Base (GSB), Wet Mix Macadam (WMM) and tests on Bitumen

3.6 States the equipment/machinery used in construction of different roads.

3.7 States the different types of joints used in C.C roads with sketches.

3.8 States the need for joints in C.C roads.

4.0 Understands Introduction and Permanent way of Railways

4.1 States the advantages of Railways.

4.2 Defines gauge and states the types of gauges.

4.3 States the component parts of a permanent way and their functions.

4.4 States the requirements of good rail, rail joint, sleeper and ballast.

4.5 Flat footed rails, Types of rail joints, rail fittings, PSC sleepers, ballast - used in Indian Railways with sketches.

5.0 Understands Station yard and Maintenance of Railways

5.1 States the different types of turnouts and crossings with sketches.

5.2 States the classification of stations.

5.3 States different maintenance measures of a railway track.

5.4 States the duties of a permanent way inspector.

6.0 Understands Bridges, Culverts and Cause ways

6.1 States the classification of bridges.

6.2 States the factors influencing selection of site for a bridge.

6.3 States the data required for preparation of bridge project.

6.4 Defines terms: Waterway, linear waterway, afflux, vertical clearance, scour depth, free board.

6.5 States the formula for economical span and afflux.

6.6 States with sketches the different components of a bridge sub-structure and their functions.

6.7 Distinguishes between deck and through bridge.

6.8 Under stand the different types of bridge super structures.

6.9 Understand the different types of a causeways and culverts.

COURSE CONTENT:

1.0 Introduction of Highway

1.1 Importance of transportation engineering-I.R.C.-Classification of roads as per I.R.C.

1.2 Cross section of a road structure-sub grade-sub-base, base and wearing course-Width of pavement, shoulder, formation width, right of way, road boundaries-road widths for different classification of roads, traffic lane widths-camber–recommended I.R.C values of camber for different roads.

1.3 Gradients-Ruling gradient, limiting, exceptional gradient –Recommended I.R.C values of gradients.

1.4 Super elevation-Necessity -Curves-necessity of curves in roads-transition curves-Horizontal alignment and vertical alignment details.

2.0 Highway Surveys and Traffic Engineering

2.1 Alignment-Factors influencing alignment of road in plain and hilly areas –Surveys-Reconnaissance, preliminary and final location surveys- data required for the preparation of highway project .

2.2 Traffic census and its importance.

2.3 Road intersections-At grade intersections-Types-Traffic islands – Channelising islands-Round about – Interchange - Fly over - Diamond intersections-Clover Leaf junction.

2.4 Pavement marking and Kerb markings.

2.5 Traffic signs-informatory signs-Mandatory signs-Cautionary signs.

3.0 Highway constructions and Maintenance

3.1 Purpose of road drainage-Surface and sub-surface drainage-Typical cross section of highway in cutting and embankment.

3.2 Materials used- Water bound macadam roads - Granular Sub Base (GSB), Wet Mix Macadam (WMM) - Maintenance of W.B.M road – Machinery used in the construction-Construction procedure.

3.3 Bitumen – Properties – Tests on Bitumen (Flash amd Fire Point and consistency tests) – Bitumen roads-Different types-Surface dressing-interface treatments-seal coat, tack coat, prime coat – premix-methods- Bitumen carpet, Bitumen concrete, sheet asphalt - Construction procedure.

3.4 Cement concrete roads-Longitudinal joints-Transverse joints-Construction joints-Construction of concrete roads-Machinery used for construction.

4.0 Introduction and permanent way of Railways

4.1 Importance of Railways-Gauges-Types of gauges.

4.2 Structure of permanent way- requirements of a good rail – Flat footed rail.

4.3 Rail joints-Types of joints-Requirements of a good rail joint-Fixtures and fastenings of rails-coning of wheels.

4.4 Sleepers-Definition-Functions- PSC sleepers–characteristics of a good sleeper- Spacing of sleepers-Sleeper density.

4.5 Ballast-Definition-Function –Characteristics of good ballast.

5.0 Station yards and Maintenance of Railways

5.1 General description and sketches for turnout –general layout of a simple left hand and right hand turnout and different crossings.

5.2 General idea with sketches of station yards.
Marshalling yard, goods yard, passenger yard and loco yard.

5.3 Maintenance of track-Duties of P.W.I (permanent way inspector).

6.0 Bridges, Culverts and Causeways

6.1 Bridges-Classification -Selection of site for a bridge- data required for the preparation of bridge project.

6.2 Defines waterway, Afflux, vertical clearance, linear waterway, freeboard for bridges and culverts-Economical span-Scour depth.

6.3 Definition and Functions of pier, abutment, wing wall and approaches.

6.4 Deck and Through bridges-Sketches and suitability of different types of bridges – Masonry bridges – R.C.C beam and slab bridges, Plate girder bridges, prestressed concrete bridges, steel trussed bridges and suspension Bridges.

6.5 Sketches and suitability of different culverts- slab culverts, pipe culverts and box culverts-Types of cause ways – Low level causeway and high level causeway.

REFERENCE BOOKS:

1. Highway Engineering by S.C.Rangawala
2. Railway Engineering by S.C.Rangawala
3. Bridge Engineering by S.C.Rangawala
4. High way Engineering by Khanna and Justo
5. Transportation Engineering by H.Krishna sharma
6. Railway Engineering by Saxena
7. Transportation Engineering by P.Venkataiah
8. A Text book of Road Engineering by Basu and Bhattacharjee

CONSTRUCTION PRACTICE

Subject Title : Construction Practice
Subject Code : C-405
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Classification of buildings and Foundations	10	26	02	02
2.	Masonry	08	13	01	01
3.	Doors, Windows and Lintels, Sunshades	08	13	01	01
4	Roofs, Floors and Stair Cases	10	16	02	01
5	Staging, Shuttering and Scaffolding	08	13	01	01
6.	Protective, decorative finishes and Termite proofing	08	16	02	01
7.	Green Buildings, Energy Management and Energy Audit of Buildings & Project	08	13	01	01
	Total	60	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the classification of Buildings and design of foundations as per NBC

1.1 List the components of a building
1.2 Explain the functions of the components of a building
1.3 Classify the buildings according to National Building Code with examples.
1.4 Explain the investigations required for foundation as per N.B.C.
1.5 Describe the following with line diagrams –
1. Spread footings,
2. Raft foundation,
3. Pile foundation and
4. Well foundation.
1.6 State the loads to be considered in design of foundation.
1.7 List rules for minimum depth, width of foundation and thickness of concrete bed for spread footing foundation.
1.8 Explain the method of constructing spread footing foundation.
1.9 List the causes of dampness at basement level.
1.10 List the effects of dampness at basement level
1.11 List the measures for prevention of dampness at basement level.

2.0 Understand the construction of masonry work

2.1 List different types of stone masonry.
2.2 Explain the different types of stone masonry.
2.3 State the general principles to be observed in stone masonry construction
2.4 Explain the following terms in brick masonry

1. Bond,
2. Course,
3. Header, and
4. Stretcher

2.5 List general principles of brick masonry.

2.6 Explain with sketches, English bond for alternate layers brick masonry of one brick wall thickness.

2.7 Explain masonry with Precast concrete solid blocks, Hollow blocks, high quality building blocks with sketches.

3.0 Understand the types and principles of doors, windows, ventilators, Lintels and sunshades

3.1 State the principles of locating doors, windows and ventilators in buildings.

3.2 Explain with sketches common and special types of doors, windows and ventilators.

3.3 List the uses of different types of doors, windows and ventilators.

3.4 Explain the fittings and fastenings of doors, windows and ventilators.

3.5 Explain the functions and types of lintels.

3.6 Explain the functions of sunshades, canopy, sun-breakers and porticos.

3.7 Explain about thin lintel developed by CBRI with simple sketches.

4.0 Understand methods of construction and finishes of different types of roofs and floorings and Stair Cases

4.1 State the functions of roofs.

4.2 State the classification of roofs.

4.3 State the classification of trusses based on material and shape.

4.4 Explain with sketches king post truss, queen post truss, fan roof truss, north light roof trusses.

4.5 State the common and decorative ceilings used in construction work.

4.6 Explain the method of fixing Plaster of Paris and fibre glass ceilings.

4.7 State the component parts of flooring.

4.8 State the functions of flooring.

4.9 List the requirements of good floor.

4.10 Explain method of construction of C.C flooring, tiled flooring, mosaic flooring, Ceramic flooring and Marble flooring.

4.11 State the principles of locating stairs.

4.12 Explain terms: rise, tread, landing, flight, going, hand rail, newal post, baluster and balustrade.

4.13 Draw the line diagrams of different stairs.

5.0 Understand Staging, Shuttering and Scaffolding

5.1 State the concept of staging.

5.2 State the purpose of scaffolding.

5.3 Define scaffolding and mention the types.

5.4 List the component parts of tubular scaffolding.

5.5 Sketch and explain about tubular scaffolding.

5.6 State the advantages of tubular scaffolding.

5.7 State the objectives of shuttering/formwork.

5.8 State the requirements of shuttering/formwork.

5.9 State the advantages of steel formwork over Timber formwork

6.0 Understand Protective, decorative finishes and Termite Proofing

6.1 State the objects of plastering.
6.2 State the methods of plastering.
6.3 State the steps in providing cement plastering on masonry walls.
6.4 State the use of wall putty as a decorative finish on masonry walls.
6.5 State the objects of pointing.
6.6 State the types of pointing.
6.7 State the objects of painting.
6.8 Explain the method of painting new and old walls surfaces.
6.9 State the paints suitable for painting wood work and steel work.
6.10 Explain briefly the method of white washing, colour washing, distempering the brick masonry wall.
6.11 Define termite proofing.
6.12 Explain the method of termite proofing.

7.0 Appreciate the concept of green building, energy management and energy audit of buildings

7.1 Concept of Green building
7.2 Explain the possible ways of energy management of buildings.
7.3 State the aims of energy management of buildings.
7.4 Distinguish among energy auditing schemes.
7.5 State the response to audit questionnaire.
7.6 Explain energy surveying and audit report.
7.7 Formulate the energy flow charts.

COURSE CONTENT

1) Classification of Buildings and foundations

a) Component parts of a building –Their functions.
b) Classification of buildings according to National building code.
c) Site investigation for foundation as per N.B.C, Trial pit, auger boring.
d) Spread footing foundation for columns and walls.
e) Raft foundation.
f) Pile foundation – RCC Piles – Bearing piles, friction piles and under reamed pile.
g) Well foundation – component parts – sinking of well foundation.
h) Different loads to be considered for the design of foundation as per IS 875 – 1987.
i) Spread foundation – Depth of foundation by Rankine's formulae– width of foundation – Thickness of concrete bed.
j) Construction of foundation (spread footing foundation only).
k) Causes, effects and prevention of dampness at basement level.

2) Masonry

a) Classification of stone masonry – Ashlar, Random rubble and Coursed Rubble Masonry – general principles to be observed while constructing stone masonry
b) Brick Masonry – Bonds in brick masonry – (English bond only) for one brick wall thicknesses – General principles to be observed in construction of brick masonry.
c) Masonry with Precast concrete solid blocks, Hollow blocks, high

quality building blocks with sketches.

3) Doors, Windows, Lintels and Sunshades

a) Doors and windows – parts of door and window – positioning.
b) Common types of doors-panelled, Glazed and Flush doors.
c) Special types of doors – Flush doors with modern construction materials, revolving doors, collapsible doors, rolling shutters, sliding doors- referring to A.P.D.S.S for size of doors and windows.
d) Windows – Panelled and Glazed.
e) Ventilators – fixed, swinging type and louvered.
f) Fittings and fastenings for doors, windows and ventilator.
g) Lintels – Functions – Types of lintels – R.C.C., wood, stone and steel.
h) Sunshade, canopy and sun breakers – lintel cum sunshade.

4) Roofs and Floorings and staircases

a) Roof – functions of roofs.
b) Classification of roofs – flat roofs – pitched roofs.
c) Different types of trusses – classification based on material and shape - King post truss, Queen post truss, Fan roof truss, North light roof truss.
d) Weather proof course on R.C.C. roof.
e) Common and decorative ceilings for auditoriums – method of fixing Plaster of Paris –Fibre glass.
f) Parts of flooring – Requirements of a good floor.
g) Methods of constructing flooring – cement concrete flooring, cement plaster flooring, Tiled flooring, mosaic flooring and Marble flooring.
h) Location of stairs.
i) Terms in stairs.
j) Types of stairs – straight, Quarter turn, half turn, Dog legged, open well, bifurcated, spiral/helical stair case, free standing and slab less stairs/staircase.

5) Staging, Shuttering and Scaffolding,

a) Staging- concept
b) Scaffolding – Purpose and types – component parts and advantages of tubular scaffolding only.
c) Shuttering/Form work – objectives

6) Protective, decorative finishes and Termite proofing

a) Plastering – purpose – Types of plastering – procedure for plastering.
External finishing – sand faced, pebble dash, acoustic plastering and marble chips – Internal finishing – wall paper and wall putty finishing.

b) Pointing – purpose –Types of pointing
c) Painting – objectives – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces.
d) White washing – colour washing – Distempering – internal and external walls.
e) Termite proofing – method.

7) Energy Management and Energy Audit of Buildings

a) Introduction to Energy Management and Energy Audit of Buildings.
b) Aims of energy management of buildings.
c) Types of energy audit.
d) Response energy audit questionnaire.
e) Energy surveying and audit report.

f) Energy flow charts.

REFERENCE BOOKS

1. N.B.C, National Building code
2. Building Construction By S.P. Arora & S.P. Bindra
3 Building Construction By Sushil Kumar
4. Building Construction By S.C.Rangawala
5. Explanatory handbook on Masonry code, SP20
6. Design of foundation structures principles and practice By Nainan P. Kurian

CIVIL ENGINEERING DRAWING-II

Subject Title : Civil Engineering Drawing -II

Subject Code : C- 406
Periods per Week : 04

Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1	Structural Planning & Marking of Frame Components	9	08	02	-
2.	R.C.C Working Drawing	42	44	01	02
3	Reading and Interpretation of Structural Drawings	9	08	02	-
	Total	**60**	**60**	**05**	**02**

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 2x20=40marks
NOTE: Use HYSD bars for main reinforcement.

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understands the structural planning of a building and marking of Frame components

1.1 Positioning & Orientation of columns
1.2 Positioning of beams
1.3 Spanning of slabs
1.4 Layout of stairs
1.5 Types of footings
1.6 Column reference scheme and
1.7 Grid reference scheme (Scheme as per IS:5525 - recommended for detailing of reinforced concrete works and SP:34)

2.0 Draws the detailed working Drawings of R.C.C.

2.1 Draws the longitudinal section and cross sections of singly reinforced simply supported beam. Prepare schedule of reinforcement and quantity of steel
2.2 Draws the longitudinal and cross section of lintel cum sunshade and prepare schedule of reinforcement and quantity of steel
2.3 Draws the plan and longitudinal section of one-way slab showing reinforcement details. Also prepare schedule of reinforcement and quantity of steel

2.4 Draws the details of reinforcement of two-way simply supported slab with corners not held down condition. Top and bottom plan and section along short and long spans have to be Drawn. Also prepare schedule of reinforcement

2.5 Draws the details of reinforcement of two-way simply supported slab with corners held down conditions. Top and bottom plan and section along short and long spans have to be drawn. (Scheduling of reinforcement is not necessary)

2.6 Draws the details of reinforcement of one-way continuous slab along with T-beam with details of slab and T-beam (plan and section of continuous slab and longitudinal section of T-beam have to be drawn). (Scheduling of steel is not necessary)

2.7 Draws the details of column and square footing (plan and sectional elevation) prepare schedule of reinforcement of column and footing and quantity of steel required

2.8 Draws the reinforcement details of dog legged stair case (section only) also prepare schedule of reinforcement for one flight including landing

3.0 Read and interpret the Drawings

3.1 Prepares the Schedule of reinforcement for a given structural Drawing

COURSE CONTENT

1.0 Structural planning of a building and marking of Frame components

1.1 Draws the position of columns, beams, slabs, stairs and footing in a given line diagram of building

1.2 Prepare member reference scheme of given building following Column reference scheme & Grid reference scheme as per IS: 5525 – (recommendations for detailing of reinforced concrete works). & SP:34

2.0 Detailed working Drawings of

2.1 Singly reinforced simply supported rectangular beam.

2.2 Lintel cum sunshade.

2.3 Simply supported one-way slab.

2.4 Two-way slab simply supported corners not held down.

2.5 Two-way slab simply supported corners held down.

2.6 One-way continuous slab and T-beam (with details of slab and T-beam)

2.7 Column with uniform thick and sloped footings.

2.8 Stair case – stairs spanning longitudinally (Dog legged stair case)

3.0 Read and interpret the Drawings

3.1 Preparation of Schedule of reinforcement for a given structural Drawing

REFERENCE BOOKS

1.0 Designing and detailing hand book (IS CODE)

C.A.D PRACTICE – I

Subject Title : CAD PRACTICE - I

Subject Code : C - 407

Periods/Week : 06

Periods/semester : 90

TIME SCHEDULE

S.No	Major Topics	No. of Periods
1.	Introduction and Practice on Computer aided Drawing	12
2.	Geometric Constructions & Elements of building drawing	18
3.	Preparation of building drawing using AUTO CAD	24
4.	Preparation of Structural Engineering drawings using CAD software.	18
5.	Preparation of Approval drawings	18
	Total	**90**

OBJECTIVES:

1.0. Introduction and Practice on Computer aided drafting (CAD)

1.1 State the applications and advantages of CAD
1.2 State the features of Auto CAD as drafting package
1.3 State the hardware requirements to run Auto CAD
1.4 Studies the drawing editor screen.
1.5 Practices the methods of selecting/entering commands to start new drawing accessing Auto CAD commands by selecting from menus, tool bars and entering Commands on command line.
1.6 Sets the limits of the drawing to get the needed working area.
1.7 Practices the 'setting commands' Grid, Snap, & Ortho Commands.
1.8 Practices 'Draw commands'- point, line, Pline, rectangle, circle, tangent, ellipse, arc, polygon.
1.9 Dimensions the given figures.
1.10 Practices 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit.
1.11 Practices 'construct commands '– offset, array, Divide, measure.
1.12 Practices 'edit commands' – Undo, Redo, Oops, CopyClip, PasteClip, Del.
1.13 Practices 'view commands' – Redraw, Regen, Zoom, Pan.
1.14 Practices 'Hatch commands' – Bhatch, Hatch.
1.15 Practices 'insert commands' – Block, Wblock, Insert, Minsert.

2.0 **Practice on Geometric Constructions and Components of Building Drawings**

3.0 Draw Plan, Section and Elevation of residential buildings using Auto CAD commands.

4.0 Draw the structural detailing drawings of the residential building.

5.0 Prepares standard drawings for Municipal approval.

COURSE CONTENT:

1.0 Introduction and Practice on computer aided drafting (CAD)

1.1 Computer graphics
1.2 Definition of CAD
1.3 Applications of CAD
1.4 Advantages of CAD
1.5 Introduction to Auto CAD as Drafting package
1.6 Study of drawing editor screen
1.7 List out methods to access Auto CAD commands.
1.8 Practice of setting up of drawing area using utility commands, & using setting commands.
1.9 Practice of entity draw commands.
1.10 Draw the given geometrical figures using draw commands.
1.11 Dimension the figures using dimensioning commands.
1.12 Practice of Modify commands.
1.13 Practice of construct commands.
1.14 Practice of edit commands
1.15 Practice of view commands.
1.16 Practice of Hatch commands.
1.17 Practice of insert commands.

2.0 Employ CAD software commands to prepare Geometric Constructions and drawings related to Building components.

2.1 Divide a given line into desired number of equal parts internally.
2.2 Draw tangent lines and arcs
2.3 Construct a hexagon from the given data.
2.4 Construct ellipse, parabola, hyperbola, cycloid, and helix.
2.5 Draw conventional signs as per I.S. standards, symbols used in civil engineering drawing.
2.6 Draw the important joinery components of the building like elevation of fully panelled double leaf door, elevation of partly glazed and partly panelled window.
2.7 Draw the important building components like section of a load bearing Wall foundation to parapet.

3.0 Residential buildings

3.1 Plan, Elevation, Section of single roomed building
3.2 Single storied load bearing type residential building
3.2.1 One bed Room House
3.3 Single storied framed structure type residential building
3.3.1 One bed Room House

4.0 Structural detailing drawings

4.1 Singly reinforced simply supported rectangular beam.
3.2 Lintel cum sunshade
3.3 Continuous Beam.
3.4 Simply supported two way slab.
3.5 Isolated Column with square footing

5.0 Drawings to be submitted for approval to corporation or municipality showing required details in one sheet such as

5.1 Plan – Showing Dimensions of all rooms

5.2 Section – showing Specifications and Typical Foundation Details

5.3 Elevation

5.4 Site Plan – Showing Boundaries of Site and Plinth Area, Car Parking, Passages and location of Septic Tank

5.5 Key plan – Showing the location of Building

5.6 Title Block – Showing signature of Owner & Licensed surveyor

COMMUNICATION SKILLS

(Common to all Branches)

Subject title : Communication skills
Subject code : C-408
Periods per week : 3
Periods per semester : 45

Introduction :

In the context of globalization , competence in speaking skills is the need of the hour The gap between the needs of the industry and the curriculum can be bridged by enabling the students to hone their speaking and listening skills. This course aims at providing opportunities for practicing speaking.

Time Schedule

Sno.	Topic	Periods	Weightage of marks (End Exam)	Sessional marks	Total
1	Listening I	3			
2	Listening II	3	10	10	20
3	Introducing oneself	3			
4	Describing objects	3			
5	Describing events	3			
6	Reporting past incidents	3			
7	Speaking from observation / reading	3	50	30	80
8	JAM	6			
9	Group discussion	6			
10	Mock interviews	6			
11	Making presentations	6			
		45	60	40	100

Objectives : Upon completion of the subject the student shall be able to

- Strengthen their listening skills
- Strengthen their speaking skills

Competencies and key competencies to be achieved by the student

Topic	**Teacher's input/ methodology**	**Students competence**
Listening I Listening II	Pre- Listening –eliciting, pictures While - Listening Post –Listening –project , writing	Identifying the main idea, Identifying specific details, Identifying parallel and contradictory ideas Drawing inferences, Reasoning
Introducing oneself	Kinds of introduction --official/ personal, dynamic vocabulary, Body language, Model introduction, Use of line ups	Use of simple present tense, Sequencing, Appropriate vocabulary
Reporting incidents	Group work /pair work, Elicit, Use of past tense, Student presentations	Use of past tense, Relevant vocabulary
Describing objects	Vocabulary , Use of adjectives, Games—I spy, Group presentations	Use of adjectives, Dimensions,shapes Compare and contrast, Sequence
Describing events	Group work/pair work Use of appropriate tense	Use of appropriate tense, Sequencing

Reporting past incidents	Use of past tense, Vocabulary Student presentations	Use of past tense , sequencing
Speaking from observation/reading	Group work/pair work, Reading techniques ,	Use of past tense, Summarising , evaluating, comprehension
JAM	Effective techniques , Good beginning , conclusion, tips, Use of line ups	Vocabulary, Sequencing, Fluency, Thinking spontaneously
Group discussion	Expressing opinion, body language	Expressing opinion, agree/ disagree, fluency, Persuasive and leadership skills
Mock interview	FAQs , body language	Role play, body language,
Making presentations	Student presentations	Using charts , pictures, interpreting data, sequencing, PPTs

Communicative methodology (CLT) should be used to create an interactive class. Apart from the suggestions given teachers are free to innovate to use any activity to improve the language competence of students . Attention can also be given to improve the accent and intonation of students.

Note:

* This subject is a theory subject.

** The workload should be calculated as theory workload.

***Examinations in the subject will be treated as a practical one.

BUILDING CONSTRUCTION PRACTICES

Subject Title : Building Construction Practices
Subject Code : C- 409
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No	Major Topics	No. of Periods
1.	Marking for the earth work of a column foundation	04
2.	Marking for the earth work for the junction of two walls	04
3.	Marking the centre line of a one roomed building	04
4.	Marking for the earth work of a simple two roomed building	08
5.	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	04
6.	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.	04
7.	Supervisory skills of Plastering of a wall.	04
8.	Supervisory skills for construction of Cement Concrete Flooring.	04
9.	Supervisory skills of fixing of floor trap, gully trap and their connections to drain.	08
10.	Placement of reinforcement in an Isolated Column Footing with proper cover.	04
11.	Placement of reinforcement for stairs spanning longitudinally (with specific attention at the junction of waist and landing slabs).	04
12.	Placement of reinforcement for sunshade, Placement of reinforcement for slab (with specific attention of chairs). OR Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	08
	Total	60

OBJECTIVES : Upon completion of the subject the student shall be able to

1.0 Marking for the earth work of a column foundation

1.1 Note down the measurements of column foundation for earth work excavation.
1.2 Mark the centre lines of column in either direction.

1.3 Mark the size of column with reference to the centre lines.
1.4 Mark the size of column footing on ground using lime powder.

2.0 Marking for the earth work of a junction of a wall

2.1 Read the width of walls at super structure from drawing.
2.2 Mark the centre line of main walls from the markings on marking pedestals.
2.3 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
2.4 Transfer the same by pouring the lime on the centre line.

3.0 Marking the centre line of a one roomed building

3.1 Read the width of walls at super structure and width of earth work excavation from drawing.
3.2 Mark the centre line of main wall from the markings on marking pedestals.
3.3 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
3.4 Mark the width of walls with reference to centre lines of walls.
3.5 Transfer the same by pouring the lime to proceed for excavation.
3.6 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.
3.7 Transfer the same by pouring lime to proceed for excavation.

4.0 Marking for the earth work of a simple two roomed building

4.1 Prepare the centre line diagram from a given drawing.
4.2 Note down width of earthwork excavation.
4.3 Mark the centre lines on the ground with the help of plumb bob.
4.4 Check the accuracy by measuring length of two diagonals and their equality.
4.5 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.
4.6 Transfer the same by pouring lime to proceed for excavation.

5.0 Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning

5.1 Note the mix proportion and take the respective quantities of cement and sand (volume of 1bag of cement = 0.035 cubic meter).
5.2 Place the measured quantity of sand to a suitable stack on an impervious hard surface.
5.3 Spread the cement uniformly over the sand stack.
5.4 Dry mix both sand and cement thoroughly to a uniform colour.
5.5 Sprinkle sufficient quantity of water on the dry mix while thoroughly mixing the dry mortar, which can be used for 30 minutes.
5.6 Continue the mixing to bring the mortar to a stiff paste of working consistency.

6.0 Construction of 230mm thick brick wall in English Bond at the corner of a wall and check for horizontality and verticality

6.1 Soak the bricks in water and air dry before their use.
6.2 Prepare C.M of specified proportion and keep ready for use
6.3 Sketch the two threads perpendicular to each other at specified corner in line with the outer edges of wall.

6.4 Arrange the quion header in line with the two perpendicular threads
6.5 Arrange the queen closure adjacent to quoin header.
6.6 Continue one layer with headers on one face and stretchers on the perpendicular face to the true line.
6.7 Continue the next layer with stretchers on headers and headers on stretchers.
6.8 Check the verticality of the wall with the help of plumb bob and horizontality with the help of level tube for every three to four layers.
6.9 Place the bricks, with frog at the top.
6.10 Fill the vertical joint in each layer with mortar using trowel.

7.0 Supervisory skills of Plastering of a wall

7.1 Prepare the surface by raking the joints and brushing the efflorescence if any by brushing and scraping dust and loose mortar.
7.2 Remove efflorescence if any by brushing and scraping.
7.3 Wash the surface thoroughly with water and keep the surface wet before commencement of plastering.
7.4 Complete the ceiling plaster before commencement of wall plaster
7.5 Fill all put log holes in advance of the plastering.
7.6 Start plastering from top and work down towards the floor.
7.7 Apply 15cm x 15cm plaster of specified thickness first, horizontally and vertically at not more than 2.0m intervals over the entire surface to serve as gauges.
7.8 Check the surfaces of gauges for truly in plane of the finished plaster surface by using a plumb bob.
7.9 Apply the mortar on the wall between the gauges with a trowel to a thickness slightly more than the specific thickness.
7.10 Use a wooden straight edge to bring to the true surface with small upward and sideways movement at a time reaching across the gauges.
7.11 Use trowel to obtain final finish surface as a smooth OR wooden float for sandy granular texture.
7.12 Avoid excessive use of trowel or over working the float.

8.0 Supervisory skills for construction of Cement Concrete Flooring

a. Base Concrete

8.1 Use cement concrete of specified mix
8.2 Provide base concrete with the slopes towards floor trap required for the flooring using tube level.
8.3 Provide a slope ranging from 1:48 to 1:60 for flooring in varandah, courtyard, kitchen and bath.
8.4 Provide a slope of 1:30 for floors in water closet portion.
8.5 Provide necessary drop of 6mm to 10mm in flooring in bath, water closet and kitchen near floor traps to avoid spread of water.

b. Finishing

8.6 Follow the finishing of the surface immediately after the cessation of beating.

8.7 Allow the surface till moisture disappears from it.
8.8 Use of dry cement or cement mortar to absorb excessive moisture not permitted.
8.9 Spread the thick slurry of fresh cement and water @ 2kg of cement over an area of 1 square metre of flooring, while flooring concrete is still green.
8.10 The cement slurry shall be properly processed and finished smooth.

8.11 Finish the edge of sunk floor rounded with C.M 1:2 and finish with a floating coat of neat cement.
8.12 Cure the surface for a minimum period of 10 days.
8.13 Lay the flooring in lavatories and bath rooms only after fixing of water closets and squatting pans and floor traps.
8.14 Plug the traps while laying and open after curing and cleaning.

9.0 Supervisory skills of fixing of floor trap, gully trap and their connections to drain.

9.1 Identify the Floor trap and Gully trap
9.2 Identify the location of fixing the floor trap and gully trap
9.3 Connect the floor trap to the drain pipe.
9.4 Fix the joint using proper filler and adhesive material such that the joint is water tight.
9.5 Fix gully trap on cement concrete foundation 65 mm x 65 mm and not less than 10 mm thick.
9.6 Prepare a mix of concrete 1:5:10 and jointing of gully outlet to the branch drain is done
9.7 Tarred gasket soaked in thick cement slurry shall first be placed round the spigot of the drain
9.8 The remainder of the socket is filled with stiff mixture of cement mortar in the proportion of 1:1.

10.0 Placement of reinforcement for an Isolated Column Footing and Column.

10.1 The grill of column footing should be kept ready as per design data.
10.2 Mark the centre lines in both directions on levelling course / bedding concrete with the help of plumb bob from the string stretched over the marking pedestals.
10.3 Mark centre of the outer reinforcing rods of footing in either direction.
10.4 Carefully place the grill such that centre line markings of outermost reinforcing rods are exactly above the centre lines marked on the bedding concrete.
10.5 Place the chairs/cover blocks of specified thickness below the bottom layer of reinforcing rods.
10.6 Exercise care for rectangular column footing while placing reinforcing mat such that bars in longer direction are at bottom.
10.7 Place the column reinforcement with chairs or cover blocks over the foundation mat.
10.8 Prepare the reinforcement as per the drawing.
10.9 Check for the verticality of column reinforcement with plumb bob
10.10 Provide lateral support for the column reinforcement to keep them in position.
10.11 Prepare the shuttering and apply waste oil inside surface of the shuttering box and fastenings
10.12 Place the shuttering box around the column and fix the fastenings.
10.13 Check for the verticality of shuttering with plumb bob

11.0 Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs)

11.1 Read the reinforcement details from the bar bending schedule
11.2 Prepare the shuttering for the stairs as per the design.
11.3 Bend the reinforcing bars to the shape and length confirming to the bar bending schedule.
11.4 Place the bars at the specified spacing maintaining the cover with the help of chairs or cover blocks.

11.5 Exercise care in the placement of reinforcement at the junction of waist and landing slab.
11.6 Tie the distributors parallel to risers at the specified spacing

12.0 Placement of reinforcement for sunshade and slab

12.1 Prepare the reinforcement as per design
12.2 Prepare the centering for sun shade
12.3 Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover
12.4 Place the cement mortar cover blocks or chairs of specified height below the main reinforcement to have prescribed cover above the reinforcement
12.5 Observe for sufficient length of anchorage of main reinforcement into the lintel or the beam etc.
12.6 Prepare the reinforcement as per design
12.7 Rest the reinforcement in slabs on bar chairs
12.8 Securely fix the bar to chairs so that it won't move when concrete is placed around it.
12.9 Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete.
12.10 Anchor the reinforcement to improve the transfer of tensile forces to the steel by bending or hooking or lapping the bars.
12.11 Read the reinforcement details from the bar bending schedule
12.12 Note down proper cover-clear cover, nominal cover or effective cover to reinforcement.
12.13 Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings.

12.14 Show enlarged details at corners, intersection of beams and column Junction
12.15 Avoid congestion of bars at points where members intersect and make certain that all reinforcement is properly placed.

12.16 In the case of bundled bars, Make lapped splice of bundled bars by splicing one bar at a time.
12.17 Stagger such individual splices within the bundle.
12.18 Make sure that hooked and bent up bars can be placed and have adequate concrete protection.

COURSE CONTENT

1. Marking for the earth work of a pillar.
2. Marking for the earth work for the junction of two walls.
3. Marking the centre line of a one roomed building
4. Marking for the earth work of a simple two roomed building.
5. Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.

6. Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.
7. Supervisory skills of Plastering of a wall.
8. Supervisory skills for construction of Cement Concrete Flooring.
9. Supervisory skills of fixing of floor trap, gully trap and their connections to drain.
10. Placement of reinforcement in an Isolated Column Footing and column with proper cover.
11. Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).
12. Placement of reinforcement for sun shade, slab, Beam column junction (with specific attention to Earth quake resistance design).

REFERENCE BOOKS

1. CPWD SPECIFIATIONS, Govt of India — Vol I&II, 2009
2. Practical Civil engineering hand book — Kale and Shaw
3. Building Construction — Bindra & Arora
4. National Building Code — BIS publication

V SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

V Semester

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods	Scheme Of Examinations			
		Theory	Practicals	Per Semester	Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-501	Steel Structures	5	-	75	3	20	80	100
C-502	Construction Technology and Project Management	5	-	75	3	20	80	100
C-503	Environmental Engineering	6	-	90	3	20	80	100
C-504	Geotechnical Engineering	4	-	60	3	20	80	100
C-505	Advanced Civil Engineering Technologies	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
C-506	Civil Engineering Drawing III	-	4	60	3	40	60	100
C-507	CAD Practice - II	-	6	90	3	40	60	100
C-508	Life skills	-	3	45	3	40	60	100
C-509	Civil Engineering Work shop	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

STEEL STRUCTURES

Subject Title : Steel Structures
Subject Code : C-501
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Introduction and Fundamentals of Limit State Design of Steel structures	04	03	01	-
2.	Design of fillet welded joints	10	16	02	01
3.	Design of Tension members	08	13	01	01
4.	Design of Compression members, Columns &Column bases	22	36	02	03
5.	Design of Beams	20	26	02	02
6.	Design of Roof trusses	11	16	02	01
	Total	75	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the Introduction and fundamentals of limit state design of steel structures

1.1 State common types of steel structures.
1.2 State the merits of Steel Structures.
1.3 State the demerits of Steel Structures
1.4 List the loads considered in the design of steel structures as per I.S:875-1987.
1.5 Describe various types of loads to be considered in the design of steel structures.
1.6 Understand the code of practice I.S. 800-2007
1.7 List physical properties of structural steel.
1.8 List mechanical properties of structural steel
1.9 Sketch different types of rolled steel sections
1.10 Classify cross sections of class 1 to 4
1.11 List types of elements.
1.12 Explain the Concept of Limit State Design.
1.13 Define ‘limit state’.
1.14 State types of limit states.
1.15 Define the following terms:
1. Characteristic action
2. Design action

3. Design strength

1.16 State the partial safety factor values for loads in limit state of strength and serviceability.

1.17 State the partial safety factor values for materials in limit state.

1.18 State the deflection limits for
1. Simply supported beam
2. Cantilever beam
3. Purlins

2.0 Understand the principles of design of Fillet Welded Joints

2.1 State different types of joints.

2.2 Differentiate the welded joints and Riveted joints

2.3 Sketch the different forms of welded joints.

2.4 Explain the features of a fillet welded joint.

2.5 State stresses in welds as per I.S.800-2007.

2.6 State formula for design strength of a fillet welded joint.

2.7 Calculate the design strength of a fillet welded joint.

2.8 Design a fillet welded joint for a given load, thickness of plate and permissible stresses as per code.

2.9 Design a fillet welded joint for a single angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.

2.10 Design a fillet welded joint for a double angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.

3.0 Understand the principles of design of Tension Members

3.1 Define ‘ tie’

3.2 State the applications of tension members.

3.3 Sketch different forms of tension members.

3.4 Understand the behaviour of tension members.

3.5 State the different modes of failures

3.6 Describe different modes of failures of tension members with sketches

3.7 State the maximum values of effective slenderness ratios as per code.

3.8 Determine the net effective area of single angle connected to gusset plate by welding.

3.9 Determine the design strength due to yielding of gross section, rupture of critical section and block shear failure of a single angle connected by welding

3.10 Understand design procedure of tension members.

3.11 Design a single angle tension member connected by welding only.

4.0 Understand the principles of design of Compression Members, Columns and Column bases

4.1 Understand the compression members

4.2 State different types of compression members (like column, strut)

4.3 Sketch different forms of compression members.

4.4 Understand the behaviour of compression members

4.5 Classify cross sections.

4.6 Distinguish between actual length and effective length.

4.7 Define the terms 1. Least radius of gyration and 2. Slenderness ratio.

4.8 State effective lengths to be used for different end conditions.

4.9 Understand buckling class of cross section like 1. Imperfection factor and 2. Stress reduction factor for different buckling classes – column buckling curves.
4.10 State maximum values of effective slenderness ratios as per code
4.11 Understand the design compressive stress for different column buckling classes.
4.12 Determine the design strength of compression members
4.13 Understand design procedure of compression members.
4.14 Design columns with I sections without built up sections.
4.15 Understand design details - effective sectional area – IS code provisions for angle struts.
4.16 Design single angle and double angle struts.
4.17 Understand IS code provisions of single / double lacing and battening for built-up columns.
4.18 Design a slab base along with a cement concrete pedestal also design the welded connection.

5.0 Understand the principles of design of Steel Beams

5.1 Understand the concept of limit state design of beams
5.2 Define the terms:
1. Elastic moment of resistance,
2. Plastic moment of resistance,
3. Elastic section modulus,
4. Plastic section modulus and
5. Shape factor.
5.3 Determine the shape factor values for rectangular, T and I sections
5.4 Understand the behaviour of steel beams.
5.5 Classify beams based on lateral restraint of compression flange.
5.6 Determine the design strength in bending (flexure) and in shear.
5.7 List the factors affecting lateral stability – influence of type of loading.
5.8 Distinguish between web buckling and web crippling.
5.9 Understand the beams failure by flexural yielding – types.
5.10 List the types of beams failure by flexural yielding
5.11 Understand laterally supported beam – holes in tension zone – shear lag effects – design bending strength.
5.12 Understand laterally unsupported beam – lateral torsional buckling of beams (theoretical concept only – no problems).
5.13 Explain effective length of compression flanges.
5.14 Understand concept of shear in beams – resistance to shear buckling.
5.15 Understand shear buckling design methods like 1. Simple post critical method and 2. Tension field method.
5.16 Understand the design of simple beams with solid webs.
5.17 Understand component parts of plate girders with sketches
5.18 Describe different types of Stiffeners with their suitability.
5.19 Design laterally supported simply supported beam considering all IS code requirements.

6.0 Understand the principles of design of Roof Trusses

6.1 List types of trusses – 1. Plane trusses and 2.Space trusses.
6.2 Understand the situations where roof trusses are used.
6.3 Sketch different types of roof trusses with their suitability for a given span.
6.4 Sketch a roof truss and name the component parts.

6.5 Understand the configuration of trusses like1. Pitched roof and 2. Parallel chord trapezoidal trusses.
6.6 Understand cross sections of truss members.
6.7 Understand the loads on roof trusses as per I.S – 875.
6.8 Explain the method of calculating the wind load on roof trusses..
6.9 Determine loads at nodal points of a given roof truss due to dead load, live load and wind load , given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and internal pressure coefficients.

COURSE CONTENT

1.0 Introduction and fundamentals of limit state design of steel structures

1.1 Merits and demerits of steel structures.
1.2 Loads considered in the design of steel structures as per I.S:875 -1987.
1.3 Introduction to I.S. 800-2007 - Mechanical properties of structural steel – yield stress (fy), ultimate tensile stress (fu) and maximum percent elongation (table -1 of IS:800-2007)
1.4 Standard structural sections – Classification of cross sections – class 1(plastic) class2(compact) class3(semi compact) and class4(slender) – types of elements – internal elements, outstands and tapered elements.
1.5 Concept of Limit State Design – limit state of strength – limit state of serviceability – classification of actions – strength – partial safety factors for loads and materials – deflection limits.

2.0 Design of Fillet Welded Joints

2.1 Different types of joints – lap joints – butt joints.
2.2 Differentiation of welded joints and riveted joints.
2.3 Different forms of welded joints – sketches of fillet and butt weld joints, slot weld and Plug weld.
2.4 Fillet welded joint – detailed sketch showing the component parts.
2.5 Stresses in welds as per I.S.800-2007 – Code requirements of welds and welding.
2.6 Problems on calculation of strength of a fillet welded joint.
2.7 Design of fillet welded joint for a given load, thickness of plate and permissible stresses as per code.
2.8 Design of fillet welded joint for single or double angles carrying axial loads.

3.0 Design of Tension Members

3.1 Introduction to tension members and different forms of tension members.
3.2 Behaviour of tension members.
3.3 Different modes of failures – gross section yielding, net Section rupture and block shear failure.
3.4 Maximum values of effective slenderness ratios as per code.
3.5 Calculation of net effective sectional area of single angle with welded connection only.
3.6 Calculation of the design strength due to yielding of gross section, rupture of critical section and block shear – problems on single angle with welded connection only.
3.7 Design procedure of tension members.
3.8 Problems on design of tension members single angle with welded connection only.

4.0 Analysis and design of Compression Members, columns and column Bases

4.1 Introduction to compression members - different forms of compression members.

3.6 Behaviour of compression members – Classification of cross sections – class 1 (plastic) class2 (compact) class3 (semi compact) and class4 (slender).

4.3 Effective lengths to be used for different end conditions – table 11 of I.S:800.

4.4 Buckling class of cross section – imperfection factor and stress reduction factor for different buckling classes – column buckling curves.

4.5 Maximum values of effective slenderness ratios as per code – design compressive stress for different column buckling classes.

4.6 Calculation of design strength of compression members – problems.

4.7 Design procedure of compression members – problems on simple sections only (no builtup sections).

4.8 Design details - effective sectional area – code provisions for angle struts – single angle and double angle – discontinuous and continuous struts.

4.9 Code provisions of single / double lacing and battening for built-up columns (no problems).

4.10 Design of slab base along with a cement concrete pedestal, design of welded connection of base plate and column – problems.

5.0 Analysis and design of Steel Beams

5.1 Concept of limit state design of beams – shape factor and plastic properties of beams – Problems on shape factor.

5.2 Behaviour of steel beams – design strength in bending (flexure).

5.3 Factors affecting lateral stability – influence of type of loading-web buckling and web crippling.

5.4 Beams failure by flexural yielding – types.

5.5 Laterally supported beam – holes in tension zone – shear lag effects -– design bending strength

5.6 Laterally unsupported beam – lateral torsional buckling of beams - (theoretical concept only – no problems).

5.7 Effective length of compression flanges.

5.8 Concept of shear in beams – resistance to shear buckling.

5.9 Shear buckling design methods - simple post critical method – tension field method.

5.10 Design of laterally supported simple beams with solid webs.

5.11 Component parts of plate girders with sketches – brief description of different types of stiffeners.

5.12 Design of laterally supported simply supported beam considering all code requirements.

6.0 Design of Roof Trusses

6.1 Types of trusses – plane trusses, space trusses.

6.2 Sketches of different roof trusses with their suitability for a given span.

6.3 Cross sections of truss members.

6.4 Loads on roof trusses as per I.S – 875.

6.5 Determination of loads at nodal points of a given roof truss due to dead load, live load and wind load, given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and Internal pressure coefficients.– problems.

REFERENCE BOOKS

1.	Code of practice: IS 800-2007	BIS, New Delhi
2.	Limit state Design of Steel Structures	S.K. Duggal/TMH
3.	Structural steel design	M.L.Gambhir/TMH
4.	Design of Steel Structures	N.Subramanian
5.	Design of Steel Structures	S.S.Bhavikatti
6.	Structural Engineering	A.P.ArulManickam
7.	Teaching Resource Material : http://www.steel-insdag.org	
8.	Teaching Resource Material : http://www.nptel.iitm.ac.in	

CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT

Subject Title : Construction Technology and Project Management

Subject Code : C-502

Periods per Week : 05

Periods per Semester : 75

TIME SCHEDULE

S No	Major Topics	No. of Periods	Weightage of marks	Short type	Essay Type
1.	Concrete Technology	15	23	01	02
2.	Construction Machinery and Equipment	06	03	01	-
3.	Building Services	07	06	02	-
4.	Preliminary planning & Organisational aspects	09	16	02	01
5.	Constructional planning, Contracts & Tenders	15	23	01	02
6.	Execution of works, Payment & Stores	15	23	01	02
7.	Basic concepts & Opportunities of Entrepreneurship	08	16	02	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the concrete Technology

1.1 Explain the relation between strength of concrete , workability and water/cement ratio
1.2 Understand 'Grades' of concrete.
1.3 State the grades of concrete recommended for different types of works.
1.4 Differentiate 'Normal strength concrete and High strength concrete'
1.5 State the factors affecting variability of concrete strength.
1.6 Understand the following special concretes
1. Fiber Reinforced Concrete,
2. Fal-G-Concrete,
3. Light weight concrete,
4. High density concrete,
5. Polymer concrete and
6. Self compacting concrete
1.7 Understand concreting under special exposure conditions like
1. Under- water concreting,
2. Cold weather concreting,
3. Hot weather concreting and
4. Concreting in high rise buildings

1.8 Explain ‘Micro concrete’ and ‘Shotcrete’.

2.0 Understand the Construction Machinery and Equipment

2.1 Understand the need for mechanization and construction activities
2.2 State the factors to be considered for the selection of type of construction equipment.
2.3 State different types of construction equipment.
2.4 Explain the uses of different construction equipment.

3 **Understand the Buildings services**

3.1 State the requirements of good lighting in building.
3.2 Define the terms 1. Glare and 2. Day light factor
3.3 State the precautions to be taken to avoid glare in building
3.4 State the requirements of good electrical wiring.
3.5 List the power rating of different domestic electrical appliances.
3.6 List the different types of electrical wirings.
3.7 State the objectives of electrical earthing.
3.8 Explain the methods of earthing
3.9 State the requirements of good ventilation.
3.10 Explain 1. Natural ventilation and 2. Artificial ventilation.
3.11 State the principles of fire protection in buildings.
3.12 State the causes of fire.
3.13 Explain about fire fighting.
3.14 State different fire detectors.
3.15 State different fire extinguishers
3.16 State different fire resistant building materials.
3.17 Explain about air conditioning.
3.18 State different types of cooling systems.
3.19 State the necessity of Safety alarm systems in buildings
3.20 State the concept of HVAC system in a residential building.

4.0 Know the objectives of Preliminary planning and organisational aspects

4.1 Defines the term construction management.
4.2 States the need for construction management.
4.3 Lists the factors involved in construction management.
4.4 Explains the importance of preliminary planning.
4.5 Explains the difference between feasibility report and project report.
4.6 Explains the data to be collected and aspects to be considered in project report.
4.7 Lists the aspects to be considered during preliminary planning in respect of:
  4.7.1 Minor irrigation project.
  4.7.2 Road project.
  4.7.3 Rural water supply project
  4.7.4 Housing colony
  4.7.5 Rural hospital.
4.8 Lists the different engineering departments of the government.
4.9 Gives the organisational structure of I and CAD, Roads and Buildings, Panchayat Raj and Public Health departments.
4.10 State the duties of various officers in Engineering Departments
4.11 Defines the terms administrative approval and technical sanction.

5.0 Understands Constructional Planning, Contracts and tender systems

5.1 Distinguishes between construction stages and construction Operations
5.2 Explains the concept and use of construction schedules.
5.3 States the need for material schedule and labour schedule.
5.4 Explains the methods of procurement of labour, material and equipment.
5.5 Explains the use of bar chart and its limitations
5.6 Lists the effects and causes of accidents and safety measures to be adopted in construction industry.
5.7 Prepares network diagram based on C.P.M for construction works.
5.8 Defines terms; Contract and contractor
5.9 Explains the various contract systems available for construction works.
5.10 Lists the merits and limitations of each of the contract systems.
5.11 Explains the need for calling of tenders.
5.12 Lists the steps involved in fixing up the agency through tender system.
5.13 Drafts a tender notice for a work.
5.14 Prepares tender documents.
5.15 Explains the need of earnest money and security deposit.
5.16 Draws up a comparative statement.
5.17 Lists out the conditions of contract agreement.

6.0 Understands Methods of execution of works, payments & stores

6.1 Explains the difference between the regular establishment and work charged establishment .
6.2 Explains the need for inspection of works.
6.3 Explains the need and methods of quality control
6.4 State the necessity for sampling and testing of materials.
6.5 States the need for departmental execution.
6.6 Explains the preparation and closing of muster rolls,
6.7 Explains the need for imprest amount.
6.8 Lists the common irregularities in a muster roll.
6.9 State the importance of Labour laws and minimum wages act
6.10 States the importance of measurement book.
6.11 Lists the rules to be followed in recording measurements.
6.12 States the need of obtaining contractors acceptance for the measurements in the M-Book.
6.13 States the need for pre-measurement and check measurement.
6.14 Lists the methods of payment to contractors.
6.15 Identifies the types of bills to be used.
6.16 States the steps involved in checking the bills.
6.17 Lists the recoveries to be made from the bills.
6.18 Identifies the different types of stores materials.
6.19 States the classification of the items held in general stock.
6.20 States the need for materials at site account.
6.21 List the use of indent, invoice in store accounts.
6.22 Explains the necessity of periodical inspection of stores.

7.0 Understands the Basic concepts & opportunities of entrepreneurship

7.1 Understands the requirements of a licenced surveyor, contractor
7.2 Lists various assisting institutions set up for development of Small Business.
7.3 Explain the assistance provided by different institutions such as NISIET, SISI, NSIC,APIDC.
7.4 State the role of financial organisation in the development of Small Scale Industries and Small Business, such as APSFC, Nationalised Bank etc.
7.5 Gives the concepts contracting.
7.6 Lists the formalities to become a contractor.
7.7 States the various concessions given to civil Engineer to start on enterprise and execute contracts.

COURSE CONTENT

1.0 Concrete Technology

1.1 Introduction – Ingredients of Concrete – Properties of Concrete – Workability-Factors influencing workability –Water/Cement Ratio-Relation between Strength of concrete and Water/Cement Ratio.
1.2 Curing of Concrete-Methods of curing.
1.3 Grade of concrete--Normal strength concrete and High strength concrete, factors affecting variability of concrete strength.
1.4 Special Concretes – fiber reinforced Concrete – Fal G-Concrete, high density Concrete, Light weight Concrete, polymer Concrete and micro Concrete – Self Compacting Concrete-Properties – uses.
1.5 Concreting under special exposure condition – cold weather Concreting – hot weather Concreting – under water concreting – Shotcrete – Concreting in high rise buildings - Micro concrete – Shotcrete.

2.0 Construction machinery and equipment

2.1 Need for use of construction Machinery.
2.2 Factors affecting selection of equipment.
2.3 Types – Crawler and Pneumatic tyred.
2.4 Excavation equipments – Tractors, Bulldozer, Grader, Scrapper, Shovel, Dragline, Clamshell, Dredgers – description-Uses.
2.5 Compaction equipments – Rollers, Tamping roller – Smooth wheeled roller – Pneumatic tyred rollers – Vibrating compactors – Description – uses.
2.6 Hauling equipments – Trucks, Dump trucks, Dumpers.
2.7 Cranes –Tower cranes.
2.8 Conveying equipments – Belt conveyors.

3.0 Building Services

1.1 Lighting requirements in a building – precautions to be taken to avoid glare in building – glare – daylight factor.
3.2 Electrical services – Requirements of good electrical wiring – types of electrical wirings – earthing – methods.
3.3 Ventilation – Requirement of good ventilation – Natural and Artificial ventilation
3.4 principles of fire protection in buildings - causes of fire - fire fighting – fire detectors - fire extinguishers - fire resistant building materials.

3.4 Air conditioning – Purpose – Air conditioning layout – Components –Types of cooling systems – Air coolers – Air conditioner – Centralized Air conditioner – Split type Air Conditioner.

3.6 Safety alarm system in buildings- necessity.

3.7 HVAC system in residential buildings- Concept.

4.0 Preliminary Planning & Organisational aspect

4.1 Construction Management –definition-need for construction Management factors involving construction management.

4.2 Importance of planning-site investigation-feasibility report and project report - collection of data and preparation of project report.

3.7 Aspects to be considered during preliminary planning - Minor irrigation project, road project, rural water supply project, housing colony, rural hospital.

4.4 Different organisations of engineering department –Organisational structure of I and CAD, Roads and Buildings, Panchayat Raj and Public Health departments P.W.D., duties of various officers – AE/AEE, DEE, EE & SE - administrative approval and technical sanction.

5.0 Construction Planning, Contracts & Tenders

5.1 Construction stage-construction operation - need for material schedule and labour schedule - procurement of labour, material and equipment -Bar chart - safety measures in construction - critical path method -preparation of net work diagram – Problem - critical path.

5.2 Terms: Contract and contractor - Legality of contracts – types of contracts – piece work – contracts –lumpsum contract – item rate contract – percentage contract – Negotiated rates –merits and limitations of each contract system

5.3 Necessity of tenders – sealed tenders – tender notice – tender documents – Earnest Money Deposit and Security Deposit – Opening of tenders – scrutiny of tenders – Comparative Statement – Acceptance of tenders, work order –contract agreement.

6.0 Execution of Works, payment of bills & stores

6.1 Regular and work charged establishment – inspection of works - need and methods of quality control - necessity for sampling and testing of materials.

6.2 Departmental execution of works- Muster roll -Imprest .

6.3 Labour laws and minimum wages act- Importance- brief explanation.

6.4 Measurement book-rules to be followed in recording measurement-pre-measurements and check measurement – contractors acceptance of measurements-preparation of bill-Types of hand receipts – modes of payment-checking of bills–-recoveries to be made from bills

6.5 Classification of stores-general stock items- consumables and non consumables-issue of stores-material-receipts-issues –transfer entry order-materials at site account-Indent-invoice–stock register-issue rate-verification of stores-accounting of shortages and surplus – write off.

7.0 Concept & opportunities of Entrepreneurship in civil engineering

7.1 Licenced surveyor, contractor, consultancy and contract services in building construction,

7.2 Significance and Concept of Small business enterprise-Assistance Programme for Small Business enterprises - Assistance provided by different institutions such as NISIET, SISI, NSIC,APIDC –Role of Banks in the development of Small Business Enterprise such as APSFC, Nationalised Bank.

7.3 various concessions given to civil Engineer to start on enterprise and execute contracts.

REFERENCE BOOKS

1. Concrete Technology M S Shetty
2. Hand book on Design of Concrete mixes S.P.23
3. Enterprenenuership and construction Management P.Venkataiah
4. Entreprenuership and construction Management N. Sreenivasulu
5. Construction Management and Accounts V.N Vazirani
6. Construction Management and Accounts Sharma
7. Management in Construction industry P.P Dharwadekar

ENVIRONMENTAL ENGINEERING

Subject Title : Environmental Engineering

Subject Code : C- 503

Periods/Week : 06

Periods/Semester : 90

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Water Supply Scheme	05	03	01	-
2.	Sources and Conveyance of Water	11	13	01	01
3.	Quality and Purification of Water	17	19	03	01
4.	Distribution System	11	13	01	01
5.	Introduction to Sanitary Engg & Quantity of Sewage	09	13	01	01
6.	Laying of Sewers & Sewers appurtenances	09	13	01	01
7.	Characteristics of Sewage, treatment & disposal	19	23	01	02
8.	Sanitation in buildings	09	13	01	01
	Total	90	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the scheme of water supply.

1.1 Explain the need for water supply schemes in the present day civil life.
1.2 Explain the connection between water supply engineering and public health.
1.3 State the need of protected water supply.
1.4 List the objectives of a protected water supply scheme.
1.5 Draw the flow chart of a typical water supply scheme of a town.
1.6 List the factors affecting per capita demand of a town/ city.
1.7 State the requirements of water for various purposes:
1. Domestic purpose,
2. Industrial use,
3. Fire fighting
4. Commercial and institutional needs and
5. Public use.
1.8 Explain the variation in demand for water supply.
1.9 Estimate the quantity of water required for a metropolitan area.
1.10 State the per capita demand for a small town for various purposes with a population of 50000
1.11 State the need for forecasting population in the design of water supply scheme.
1.12 State different methods of forecasting of population
1.13 Work out simple problems on forecasting population by different methods.

2.0 Understand the different sources and conveyance of water.

2.1 State the common sources of water for a water supply scheme
2.2 State different types of surface sources of water.
2.3 State different types of sub surface sources of water.
2.4 State the merits and demerits of surface and ground water sources for a water supply scheme of a town.
2.5 State the salient features of various surface sources.
2.6 Define
1. Aquifer,
2. Aquiclude and
3. Ground water table.
2.7 Classify wells according to construction.
2.8 Define
1. Draw down,
2. Critical depression of head,
3.Circle of influence,
4. Cone of depression,
5. Confined aquifer,
6. Unconfined aquifer and
7. Specific yield.
2.9 Explain the procedure for determining yield of a well by pumping tests (Constant Pumping and Recuperation Tests)
2.10 Explain the following with sketches:
1. Infiltration galleries.
2. Infiltration wells.
2.11 Describe the intakes for collection of water (reservoir intake, river intake, canal intake and lake intake) with sketches
2.12 Explain different methods of conveyance of water.
2.13 List the merits and demerits of different types of pipes used for conveyance of water.
2.14 Explain different joints used for connecting pipes with sketches
2.15 Describe the standard method followed in laying and testing the water supply mains.

3.0 Understand the Quality as per IS code and methods of purification of water

3.1 State different types of impurities present in water.
3.2 State the need for laboratory tests for testing water.
3.3 Explain the method of obtaining samples for testing.
3.4 Explain different tests for analyzing quality of water with their significance.
3.5 Define
1. E-coli index and
2. Most Probable Number (MPN).
3.6 Explain the significance of E-Coli in water analysis.
3.7 Explain the importance of chemical and bacteriological analysis of water used for domestic purpose.
3.8 State the various water borne diseases in India.
3.9 State the maximum acceptable limits of the following for the public drinking water:
1. Turbidity,
2. Hardness,
3. Nitrates and

4. Fluorides

3.10 State the objectives of treatment of water.

3.11 Sketch the overall layout of a water treatment plant indicating the different stages.

3.12 List the points to be considered in the location and layout of treatment plant.

3.13 State the objectivess of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation,
4. Filtration and
5. Disinfection.

3.14 Explain the process of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation and
4. Filtration

3.15 Describe different types of sedimentation tanks.

3.16 Describe the construction and operation of
1. Slow sand filters and
2. Rapid sand filters

3.17 Compare
1. Slow sand filters and
2. Rapid sand filters

3.18 Define disinfection of water

3.19 Explain the need for disinfecting water

3.20 Explain the methods of disinfection of water.

3.21 Explain different forms and points of Chlorination.

3.22 Explain the temporary hardness and permanent hardness of water

*NOTE: no design of treatment units.

4.0 Understand the systems of distribution and Water supply arrangements in Buildings

4.1 State the requirements of good distribution system.

4.2 Classify distribution system.

4.3 Explain different systems of distribution with sketches

4.4 State and explain different methods of water supply system with their merits and demerits.

4.5 State the necessity for service reservoirs.

4.6 List various appurtenances used in a distribution system of water supply system to a town.

4.7 Explains with sketches the location and functioning of various appurtenances used in a distribution system of water supply

4.8 Define terminology used while making water supply arrangements in buildings.

4.9 State the principles in laying pipelines within the premises of a building.

4.10 Explain the general layout of water supply connections of buildings with mains and suggests a suitable interior water supply arrangements for single and multi-storied buildings as per I.S Code.

4.11 State the general precautions to be taken in plumbing work for buildings.

4.12 Describe the constructional details and uses of different fittings: ferrule, goose neck, stopcock.

5.0 Understand the basics of sanitary engineering and Quantity of sewage

5.1 State the objectives of sewage disposal works.
5.2 Define the terms:
1. Sewage,
2. Sewer and
3. Sullage.
5.3 Explain the following:
1. Sewerage,
2. Refuse and
3. Garbage
5.4 List the objectives of sewerage works.
5.5 Explain types of sewerage systems and their suitability – separate, combined and partially separate systems.

5.6 Define Dry weather flow.
5.7 State the factors affecting dry weather flow.
5.9 Explain the variation in rate of sewage.
5.10 Estimate the quantity of storm water flow using 1. Rational method and 2. Empirical formulae.
5.11 List the requirements of good surface drains.
5.12 Describe different types of surface drains with their merits and demerits.
5.13 State the limiting velocities of flow in sewers.
5.14 Works out simple problems on design of sewers running half full only.

6.0 Understand the Types of sewers, laying of sewers and appurtenances

6.1 State various shapes of sewers.
6.2 Explain the circular sewer with a sketch
6.3 List the merits and demerits of circular sewer
6.4 Mention different materials used for sewers.
6.5 Explain the method of laying the sewers as per given alignment.
6.6 State the necessity to provide sewer appurtenances on the sewer lines.
6.7 List the various sewer appurtenances on a sewer line.
6.8 Explain the necessity of providing manhole in sewer line with the help of a sketch.
6.9 Explain the construction, function and location of the different sewer appurtenances.

7.0 Understand the characteristics of sewage

7.1 Define strength of sewage.
7.2 Describe the method of sampling sewage.
7.3 State the physical, chemical and biological characteristics of sewage.
7.4 Define C.O.D and B.O.D
7.5 State the significance of the BOD test to analyse sewage.
7.6 State the characteristics of industrial waste water.
7.7 State the objects of sewage treatment.

7.8 Draw the conventional sewage treatment plant of a town and indicate the main function of each unit.

7.9 State the function of screens, skimming tanks and grit chambers.

7.10 Explain briefly the working of screens, grit chambers, skimming tanks.

7.11 Describes with sketch wherever necessary the following treatment works.

a) sedimentation tank.
b) Trickling filters.
c) Activated sludge process.

7.12 Explain Sludge digestion process and list the methods of sludge disposal.

7.13 Explain with sketch the treatment of sewage by septic tank.

7.14 Determine the dimensions of a septic tank for given data.

8.0 Know the Sanitation in Building

8.1 State the aims of building drainage .

8.2 State the requirements of good drainage system in buildings.

8.3 Explain the terms: soil pipe, waste pipe, vent pipe, anti- syphonage pipe.

8.4 Describe the layout of sanitary fittings and house drainage arrangements for buildings (single and multi-storied).

8.5 Explain with sketches the different types of plumbing systems.

8.6 Describe different sanitary fittings like water closets, flushing cisterns, urinals, inspection chambers, traps, anti-siphonage pipes.

8.7 Explain the procedures involved in the inspection, testing and maintenance of sanitary fittings.

COURSE CONTENT

1. Introduction to Water Supply Scheme and Quantity of water

1.1 General importance of water supply.

1.2 Development of Water supply.

1.3 Need for protected Water supply.

1.4 Flow chart of a typical water supply scheme.

1.5 Total quantity of water for a town, per capita demand and factors affecting demand.

1.6 Water requirements for domestic purposes, industrial use, fire fighting, commercial and institutional needs, public use.

1.7 Variation in demand - peak demand – seasonal, daily and hourly variation.

1.8 Forecasting population by arithmetical, geometrical and incremental increase methods-problems on above methods.

2. Sources and Conveyance of Water

2.1 Surface source- Lakes, streams, rivers and impounded reservoirs.

2.2 Underground sources-springs, wells, infiltration wells and galleries.

2.3 Yield from wells by constant pumping and recuperation tests. (No problems required)

2.4 Comparison of surface and subsurface sources.

2.5 Types of intakes:
(i) Reservoir intake;
(ii) River intake;
(iii) Canal intake.
(iv) Lake intake.

2.6 Conveyance of water-open channels, aqueduct pipes.

2.7 Pipe Materials - C.I Pipes, Steel Pipes, concrete pipes, A.C. Pipes, G.I. Pipes Plastic Pipes (PVC &HDPE), merits and demerits of each type.

2.8 Pipe joints - spigot and socket joint, flange joint, expansion joint for C.I. Pipe, joints for concrete and asbestos cement pipes.

2.9 Pipe Laying and testing-Leak detection

3. Quality and Purification of water.

3.1 Impurities of water - need for laboratory test – sampling- grab and composite sampling.

3.2 Tests of water - physical, chemical and bacteriological tests – p^H value of water.

3.3 Standard quality for domestic use and industrial purposes.

3.4 Flow diagram of different treatment units.

3.5 Aeration - methods of aeration.

3.6 Sedimentation - plain sedimentation and sedimentation with coagulation.

3.7 Filtration - Construction and operation of slow sand & rapid sand filters.

3.8 Disinfection of water - necessity and methods of chlorination , pre-chlorination, break point chlorination

3.9 Hardness – Types of Hardness

NOTE: No design of treatment units

4. Distribution system and water supply arrangements in a Building.

4.1 General requirements, systems of distribution - gravity system, combined system, direct pumping.

4.2 Methods of supply - Intermittent and continuous.

4.3 Storage - underground and overhead-service reservoirs - necessity.

4.4 Types of layout - dead end, grid, radial and ring system

4.5 Location and functioning of:
(i) Sluice valves.
(ii) Check valves or reflux valves.
(iii) Air valves.
(iv) Drain valves or blow-off valves
(v) Scour valves.
(vi) Fire Hydrants.
(vii) Water meters.

4.6 Water supply arrangements in building:
Definition of terms; water main, service pipe, communication pipe, supply pipe, distribution pipe, air gap.

4.7 General lay-out of water supply arrangement for single and multi- storeyed buildings as per I.S Code of practice-general principles and precautions in laying pipelines within the premises of a building.

4.8 Connections from water main to building with sketch.

4.9 Water supply fittings, their description and uses - stopcock, ferrule, goose neck etc.

5. Introduction and Quantity of Sewage

5.1 Object of providing sewerage works.

5.2 Definition of terms : sullage, sewage, sewer and sewerage – classification of sewage.

5.4 Types of sewerage systems and their suitability – separate, combined and partially separate systems.

5.5 Quantity of discharge in sewers, dry weather flow, factors affecting dry weather flow, variation in rate of sewage

5.6 Determination of storm water flow – run off co-efficient, time of concentration, rational method and empirical formulae for run-off.

5.7 Surface drainage - requirements, shapes of surface drains.

5.8 Simple problems on design of sewers (running half full only) using Manning's and Hazen Williams formulae .

6.0 Laying of Sewers and Sewer Appurtenances

6.1 Different shapes of cross section for sewers – circular and non-circular – merits and demerits of each.

6.2 Brief description and choice of types of sewers - stone ware, cast iron, cement concrete sewers and A.C Pipes.

6.3 Laying of sewers - setting out alignment of a sewer, excavation, checking the gradient , preparation of bedding, handling, lowering, laying and jointing, testing and back filling.

6.4 Brief description, location, function and construction of

i) Manholes.
ii) Drop manholes.
iii) Street inlets.
iv) Catch basins.
v) Flushing tanks.
vi) Regulators.
vii) Inverted siphon.

7.0 Sewage Characteristics

7.1 Strength of sewage, sampling of sewage, characteristics of sewage; physical, chemical and biological.

7.2 Analysis of sewage - significance of the BOD test.

7.3 Characteristics of Industrial waste water–principles of treatment, Reduction of volume and strength of wastewater, Equalization, Neutralization and proportioning.

7.4 Preliminary treatment - Brief description and functions of following units. i)Screens, (ii) Skimming tanks and (iii) Grit chambers.

7.5 Primary treatment - Brief description and functions of Plain sedimentation, simple problems on the design of sedimentation tanks.

7.6 Secondary treatment - Brief description of
i)Trickling filters (ii) Activated sludge process

7.7 Sludge digestion – Process and methods of sludge disposal.

7.8 Miscellaneous treatments- septic tank.- design of septic tank.

8.0 Sanitation in Buildings

8.1 Aims of building drainage and its requirements – General layout of sanitary fittings to a house - drainage arrangements for single and multi storied buildings as per IS code of practice-plumbing systems.

8.2 Sanitary fittings – traps, water closets, flushing cisterns, urinals, inspection chambers, anti siphonage - Inspection, testing and maintenance of sanitary fittings.

REFERENCE BOOKS

1. Environmental Engineering G.S. Birdie
2. Elements of Public Health engineering K.N. Duggal
3. Environmental Engineering Baljeet Kapoor
4. Public Health Engineering S.K. Hussain
5. Environmental Engineering Ramachandraiah
6. Water supply and sanitary Engineering V.N. Vazirani
7. Environmental Engineering N.N.Basak/TMH

GEOTECHNICAL ENGINEERING

Subject Title : GEOTECHNICAL ENGINEERING

Subject Code : C-504

Periods/Week : 04

Periods/Year : 60

TIME SCHEDULE

S. NO	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	General characteristics of Soils	10	13	1	1
2	Soil exploration	03	8	1	½
3	Essential properties of soils	15	23	1	2
4	Classification of soils	02	10	-	1
5	Hydraulic and mechanical properties of soils	03	8	1	½
6	Bearing capacity of soils	10	16	2	1
7	Settlement of foundation	04	8	1	½
8	Consolidation of compressive soils	03	8	1	½
9	Compaction of soils	10	16	2	1
	TOTAL	**60**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 General Characteristics of Soils

1.1 Explains the importance of soil mechanics
1.2 Lists the types of soils
1.3 Describes the hydrometer analysis and sieve analysis of soil particles
1.4 Knows the semi-logarithmic grain size curve.
1.5 Defines the physical properties of soils like plasticity, cohesion and consolidation

2.0 Understands the basic concepts of soil exploration

2.1 Explains the need for soil exploration
2.2 Lists the methods of soil exploration
2.3 Describe briefly the subsoil and ground water exploration

3.0 Understands the essential properties of soils

3.1 Explains the method of disturbed soil sampling for testing

3.2 Defines the terms *"soil moisture content", "plasticity". "Atterberg's Limits – Liquid limit, Plastic limit and Shrinkage Limit", "plasticity index",* specific gravity of soil particles, *"dry density", "saturated density", "submerged density", "void ratio",* and *"porosity"*

3.3 Explain the test for soil moisture content by oven drying method – tests for determination of Atterberg's Limits – test for specific gravity by Pycnometer method

3.4 Expresses the relationships between volume of voids, moisture content, density of soil mass, dry density, saturated density, submerged density, specific gravity, void ratio, porosity. Degree of saturation, percentage of air voids, air content and density index

3.5 Works out simple problems using the relationships between various soil parameters

4.0 Understand the various classifications of soils

4.1 States the different systems classification of soils

4.2 Explains the textural classification of soils with a neat sketch

4.3 I.S. classification of soils

5.0 Understands the hydraulic and mechanical properties of soils

5.1 Explains the permeability of soils and compressibility of confined layers of soil.

5.2 Explains the shear resistance concept of soils

5.3 Describes the direct shear test experiment.

6.0 Understand the basic principles of bearing capacity of soils

6.1 Defines the bearing capacity and its importance in the design of foundations

6.2 Explains the importance of 'factor of safety' and 'safe bearing capacity' values in foundation design

6.3 States the presumptive bearing capacity values and the IS code equation for the calculation of bearing capacity

6.4 Explains the 'field plate load test' for determining the ultimate bearing capacity of soils

7.0 Understand the basic principles of 'Settlement of Foundation'

7.1 Defines the concept of 'settlement'

7.2 Briefly explains the vertical pressure in soil beneath loaded areas

7.3 Describes briefly the importance of bearing capacity and also settlement in the design of foundations

8.0 Understand the basic concepts of consolidation of compressible soils

8.1 Defines the principle of 'consolidation'

8.2 Explain in detail, the Terzaghi's model analogy of compression springs, showing the process of consolidation

8.3 Explain the field implications of consolidation

9.0 Understand the basic principles of compaction of soils

9.1 Explains the basic principles of compaction and its objectives
9.2 Describes the factors affecting Compaction
9.3 Describes the proctor's compaction test and modified proctor's compaction test
9.4 Explains the field measurement of compaction by core cutter method and sand replacement method.
9.5 Explain the term C.B.R. and its importance in the design of pavements

COURSE CONTENT

1.0 General characteristics of Soils

1.1 Soil mechanics – its importance
1.2 Types of soils – Residual soil, Transported soil, sand, silt, clay, peat, loess, murram, caliche, , bentonite – soils in India
1.3 Mechanical analysis of soils – Hydrometer and sieve analysis of soil particles – semi logarithmic grain size curve
1.4 Physical properties of soils – plasticity, cohesion, consolidation

2.0 Soil Exploration

2.1 Soil exploration – need for soil exploration – methods of soil exploration – Sub soil and ground water exploration - a brief overview

3.0 Essential properties of soils

3.1 Preparation of disturbed soil samples for testing – soil moisture content – oven drying method - soil plasticity

3.2 Atterberg's Limits - liquid limit, Plastic Limit, Shrinkage Limit – tests for determination of Atterberg's Limits – plasticity index

3.3 Specific gravity of soil particles – pycnometer method

3.4 Definitions and relationships of volume of voids, moisture content, density of soil mass, dry density , saturated density, submerged density, specific gravity, void ratio, porosity, degree of saturation, percentage of air voids, air content, density index, - simple problems using the above relationships

4.0 Classifications of Soils

4.1 Classification of soils –different systems of classification of soils – textural classifications of soils – I.S. classification of soils

5.0 Hydraulic and Mechanical Properties of Soils

5.1 Permeability of soils

5.2 Compressibility of soils

5.3 Shearing resistance of soils – shear strength experiment with Direct shear apparatus. (Explanation of testing procedure only)

6.0 Bearing Capacity of Soils

6.1 Bearing capacity – definition – importance of bearing capacity in foundation design – bearing capacity of shallow footings

6.2 Importance of factor of safety – safe bearing capacity values in foundation design

6.3 presumptive bearing capacity values – code equation for computing bearing capacity (No derivation) - field plate load test

7.0 Settlement of Foundation

7.1 Settlement – definition – vertical pressure in soil beneath loaded areas – foundation settlement

7.2 Importance of bearing capacity and settlement in building foundations (qualitative treatment only)

8.0 Consolidation of Compressible Soils

8.1 Consolidation – definition- Terzaghi's model analogy of compression/ springs showing the process of consolidation – field implications

9.0 Compaction of Soils

9.1 Theory of compaction – compaction and its objectives – factors affecting compaction

9.2 Laboratory compaction tests – Proctor's compaction test – Modified Proctor compaction test

9.3 Field measurement of compaction by core cutter method and sand replacement method – California Bearing Ratio – definition and its importance in the design of pavements

REFERENCE BOOKS

1.	Soil mechanics and foundation engineering	Dr.B.C. Punmia
2.	Modern Geo technical Engineering	Alam Singh
3.	Soil Mechanics' (SI Version)	T. Willim Lambe and Robert V.Whitman
4.	Geo technical Engineering'	Dr. C. Venkatramaiah.

ADVANCED CIVIL ENGINEERING TECHNOLOGIES

Subject title : Advanced Civil Engineering Technologies

Subject code : C-505

Periods per week : 06

Periods per semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Smart Technologies	20	16	2	1
2.	Electronic Surveying Instruments	10	13	1	1
3.	Pre stressed Concrete	15	23	1	2
4	Advanced methods in Earth retaining structures	15	16	2	1
5	Pre fabricated building technology	12	16	2	1
6	Earth quake resistant Structures	9	13	1	1
7	Solar energy utilization in buildings	9	13	1	1
	Total	90	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1. **Knows the Smart Technologies**

1.1 Understand the overview of Internet of Things(IoT)

- 1.1.1 Define the term IoT
- 1.1.2 State the working principle of IoT.
- 1.1.3 List the key features of IoT
- 1.1.4 List the components of IoT (hardware, software, technology and protocols)
- 1.1.5 List the advantages and disadvantages of IoT

1.2 Understand the applications of IoTin various fields of engineering

- 1.2.1 Mention the application of IoT in Smart Cities
- 1.2.2 State the application of IoT in Smart Energy and the Smart Grid
- 1.2.3 Mention the application of IoT in Smart Transportation and Mobility
- 1.2.4 State the application of IoT in Smart Home, Smart Buildings and Infrastructure
- 1.2.5 Mention the application of IoT in Smart Factory and Smart Manufacturing
- 1.2.6 Mention the application of IoT in Smart Health
- 1.2.7 Mention the application of IoT in Food and Water Tracking and Security
- 1.2.8 Mention the application of IoT in Social Networks

2.0 Understand the principles and uses of Electronic Surveying instruments

2.1 List the modern surveying instruments
2.2 Explain the principle and uses of EDM
2.3 Explain the features of electronic theodolite and distomat
2.4 State the uses of electronic theodolite and distomat
2.5 Define GPS
2.6 Explain the working principle of GPS
2.7 Explain the segments of GPS
2.8 Enumerate the types of GPS receivers
2.9 Explain the method of taking coordinates of various points using GPS
2.10 List the applications of GPS in civil Engineering
2.11 List merits and demerits of GPS
2.12 Define GIS
2.13 State the components of GIS
2.14 List the types of data used in GIS
2.15 Explain the data used in GIS
2.16 Define map
2.17 List the types of map projections
2.18 List the uses and applications of GIS in civil Engineering

3.0 Understand the Pre stressed concrete

3.1 Understand fundamental principles of prestressed concrete, systems and types of Prestressing,merits and demerits
3.2 State the materials and permissible stresses
3.3 List the losses of prestress
3.4 Explain the methods of 1. Pre stressing and 2. Pretensioning system 3.Post-tensioning systems

4.0 Advanced methods in Earth retaining structures

4.1 Understand the concepts of advanced earth retaining structures
4.2 list the advantages of advanced earth retaining structures
4.3 List and explain the methods of advanced earth retaining structures – reinforced anchored earth wall – geogrids – geomats

5.0 Pre fabricated building technology

5.1 State alternatives for cast in-situ structures
5.2 Understand pre fabrication technology
5.3 State Importance for standardisation and modularisation
5.4 State the pre fabricated structures – explain their utility
5.5 State advantages of the pre fabricated structures
5.6 State Materials used in pre fabricated elements and explain their suitability for various climatic conditions
5.7 Explain types of pre fabricated systems – large panel systems - frame systems – slab / column systems with walls – mixed systems

6.0 Understand Earth quake resistant structures

6.1 List causes of seismic waves, basic terminology
6.2 Explain 1. Magnitude, 2. Intensity and 3. Energy release
6.3 Characteristics of earthquake
6.4 Understand basic terminology of Earthquake

6.5 Explain seismic zoning
6.6 Explain seismic resistant construction with brick/stone masonry buildings as per IScode provisions
6.7 Understand seismic resistant construction and detailing of R.C. buildings as per code provisions

7.0 Understand the concept of solar energy utilization in buildings

7.1 Explain the active and passive concepts in heating and cooling
7.2 List the various solar energy utilities like solar water heaters, solar air heaters, solar cookers , lighting and water pump sets and solar PV panels

COURSE CONTENT

1. Smart Technologies :

Overview of IoT - Define IoT, how IoT work, key features of IoT, components of IoT : hardware, software, technology and protocols, advantages and disadvantages of IoT - IoT Applications - Smart Cities, Smart Energy and the Smart Grid, Smart Transportation and Mobility, Smart Home, Smart Buildings and Infrastructure, Smart Factory and Smart Manufacturing, Smart Health, Food and Water Tracking and Security, Participatory Sensing, Social Networks

2. Electronic Survey instruments and GPS and GIS

2.1 Principle and uses of EDM – Electronic theodolite and distomat, features – uses
2.2 Global positioning system (G.P.S) – principle – segments – space, control and user segments – receivers – observation and data processing - applications in Civil Engineering – advantages and disadvantages of GPS
2.3 Geographical Information System (GIS) – definition – components – Map – Map projections – types data used – use and application of GIS in Civil Engineering.

3. Prestressed Concrete

3.1 Introduction – Basic principles – Systems of prestressing – Types of prestressing Advantages and Disadvantages.
3.2 Requirements of steel and concrete for prestressed concrete.
3.3 Losses of Prestress.
3.4 Tensioning devices – Method of Prestressing – Pretensioning system – Post tensioning systems – Freyssinet, Magnel-Blaton, Gifford Udal and LeeMcal Systems.

4 Advanced methods in Earth retaining structures

4.1 Concept of advanced earth retaining structures
4.2 Advantages of advanced earth retaining structures
4.3 Methods of advanced earth retaining structures –
Reinforced anchored earth wall
geogrids
geomats

4 Pre fabricated building technology

5.1 Alternatives for cast in-situ structures - Understand pre fabrication technology - Importance for standardisation and modularisation – pre fabricated structures their utility & advantages
5.2 Materials used in pre fabricated elements – suitability for various climatic conditions

5.3 Types of pre fabricated systems – large panel systems - frame systems – slab / column systems with walls – mixed systems

6 Earth quake resistant structures

6.1 Causes of seismic waves – Magnitude, intensity and energy release – basic terminology – Characteristics of earthquake – seismic zoning

6.2 Seismic resistant construction of brick and stone masonry buildings – Provisions of I S : 4326

6.3 Seismic resistant construction of R.C. Buildings – Detailing as per Provisions of I S : 13920

7 Solar Energy Utilization in Building

7.1 Active - Passive concepts of solar Heating and cooling

7.2 Solar energy utilities – water heaters, air heaters, cookers, lighting and water pump sets.

7.3 Roof top Solar power generation systems

REFERENCE BOOKS

1. Fundamentals of Geotechnical Engineering By Braja M.Das
2. Prestressed Concrete By N Krishna Raju, Mc Graw Hill, New Delhi.
3. CBRI Building materials and components.
4. NPTEL Lecture 31, Reinforced Soil Retaining walls-Design and Construction Prof. Sivakumar Babu, IISc, Bangalore.
5. Prefab Architecture, a guide to modular design & construction Ryan E Smith, John Wiley Publishers.
6. Earthquake resistant design of structures By Shashikant K.Duggal.
7. Earthquake disaster reduction: Masonry Buildings Design and Construction By Anand Swarup Arya.

CIVIL ENGINEERING DRAWING III

Subject Title : **Civil Engineering Drawing - III**

Subject Code : **C - 506**

Periods/Week : **04**

Periods/semester : **60**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Culverts	10	25+12	1	01 (25marks)
2.	Bridges	10		1	
3.	Public health engineering drawings	18		1	
4.	Irrigation drawings	22	23	2	01 (15marks)
	Total	60	60	05	02

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 25+15 =40marks

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Draw different views of culverts.

1.1 Draws the plan, cross sectional elevation and longitudinal sectional elevation of pipe culvert, R.C.C –slab culvert and identifies the component parts from the given set of specifications.

2.0. Draws different views of T. Beam bridge

2.1 Labels the component parts of a given R.C.C. T-beam bridge.

2.2 Draws the sectional elevation, plan and cross section of Two span R.C.C T-beam bridges from the set of given specifications.

3.0 Draws the component parts of Public health Engineering works

3.1 Draws the sectional elevation, plan and cross section of public health Engineering works.

3.2 Draw the plan of water supply and drainage connections in a residential building

4.0 Draws the different views of irrigation Engineering structures

4.1 Draws the sectional elevation, plan and cross section of different Irrigation Engineering structures.

COURSE CONTENT

1.0 Simple Culvert.

Draw the plan, cross-sectional elevation and longitudinal sectional elevation of

1.1 Pipe culvert (Single Pipe)

1.2. R.C.C slab culvert with square returns.

1.3. R.C.C slab culvert with splayed wings

2.0 Bridges.

2.1 Two-Span R.C.C T-beam bridge with square return walls.
2.2 Two-Span R.C.C T-beam bridge with splayed wing walls and Returns walls.

3.0 Public health engineering drawings.

3.1 Sanitory block of a large building showing internal water supply and sanitary fittings and plumbing fixtures (Plan & Section across each unit)

3.2 Water supply and Sanitary connections to a residential building.
3.3 Septic tank with details of connection to a dispersion trench/soak pit
3.4 R.C.C overhead square tank.(four columns with accessories).

4.0 Irrigation engineering drawings

4.1 Earthen bunds –
a) Homogeneous b) Non Homogeneous (Zoned embankment)

4.2 Tank surplus weir with splayed wing walls.
4.3 Canal drop (notch type)
4.4 Tank sluice with tower head.
4.5 Canal regulator

REFERENCE:

1. Civil Engineering Drawing by A. Kamala.
2. Civil Engineering Drawing by Chakraborthy.

CAD PRACTICE – II

Subject Title : **CAD PRACTICE - II**

Subject Code : **C-507**

Periods/Week : **06**

Periods/semester : **90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Culverts and Bridges	24
2.	Public health engineering drawings	24
3.	Irrigation engineering drawings	24
4.	Estimates of Quantities of building components using MS Excel	12
5.	Study of software packages for civil engineering	06
	Total	90

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Draws different views of culverts and bridges

1.1 Draws the plan,cross sectional elevation and longitudinal sectional elevation of pipe culverts, R.C.C.- slab culvert and identifies the component parts from the given set of specifications.

1.2 Draws the sectional elevation, plan and cross section of two span R.C.C. T-beam bridges from the given set of specifications.

2.0 Draws the Components of Public health engineering works

2.1 Draws the sectional elevation, plan and cross-section of public health engineering works.

2.2 Draw the Layout of water supply and drainage connections in residential buildings.

3.0 Draws the different views of irrigation engineering structures

3.1 Draw the sectional elevation, plan and cross section of different irrigation structures.

4.0 Practice exercises on Ms-excel- Reports with MS-Word.

5.0 Knows about different packages available for Analysis, Design, Drafting, Estimation packages.

COURSE CONTENT

1.0 Preparation of Plan,cross sectional elevation and longitudinal sectional elevation of

1.1 Pipe Culvert (Single Pipe)

1.2 R.C.C. slab culvert with square returns

1.3 Two-span R.C.C. T-beam bridge with square walls.

2.0 Preparation of Layouts of water supply & Sanitary lines in buildings

2.1 Sanitary block of a large building showing internal water supply and sanitary fittings and plumbing fixtures (Plan & Section across each unit)

2.2 Water supply & sanitary connections to a residential building

2.3 Septic tank with details of connection to a residential building.

2.4 R.C.C overhead square tank(four columns with accessories).

3.0 Preparation of Plan,cross sectional elevation and longitudinal sectional elevation Of

3.1 Earthen bunds –

a) Homogeneous b) Non Homogeneous (Zoned embankment)

3.2 Tank surplus weir with splayed wing walls

3.3 Canal drop (notch type)

3.4 Tank sluice with tower head.

3.5 Canal regulator.

4.0 Computer application by using MS Word & MS Excel

4.1 Test report of the building materials using MS-Word.

4.2 Complete estimation of a residential building using MS-Excel involving linkage of cells in different sheets viz., Lead statement, Data sheet, detailed . estimation and Abstract estimation

5.0 Study of Packages available for Analysis, Design, Drafting and Estimation.

5.1 Analysis – Staad pro, SCADS, Ansys, GT Studl, E-Tab, ASAP.

5.2 Design – Staad pro, STRUDS etc.,

5.3 Drafting – Auto CAD, Intelli CAD, Architectural CAD etc.,

LIFE SKILLS

Subject Title : Life Skills
Subject Code : C-508
Scheme : C-16
Periods/ Week : 03
Periods/Semester : 45

TIME SCHEDULE

Sl No.	UNITS	No. of periods Allotted		
		Explanation	Activities	Total
1.	ATTITUDE	1	3	4
2.	ADAPTABILITY	1	3	4
3.	GOAL SETTING	1	3	4
4.	MOTIVATION	1	3	4
5.	TIME MANAGEMENT	1	3	4
6.	CRITICAL THINKING	2	3	5
7.	CREATIVITY	1	3	4
8.	PROBLEM SOLVING	1	3	4
9.	TEAM WORK	1	3	4
10.	LEADERSHIP	1	3	4
11.	STRESS MANAGEMENT	1	3	4
TOTAL		12	33	45

Note: No Written Examination; The total 45 hours are to be considered as Theory hours.

Marks: Internal – 40; External – 60

OBJECTIVES

Upon the completion of this subject the student shall be able to

1.0 Understand the concept of Attitude

1.1 Define 'Attitude'

1.2 Explain the importance of Attitude

1.3 Distinguish between Positive and Negative Attitudes

1.4 Life Response: Need for change of Attitude

1.5 Positive Attitude: Key to success in Personal and Professional Lives

2.0 Understand the concept of Adaptability

2.1 Define the term 'Adaptability'

2.2 Explain the concept of Adaptability

2.3 Advantages of Adaptability

2.4 Disadvantages of Lack of Adaptability

2.5 Need for positive response to change

3.0 Understand the concept of Goal setting

3.1 Define the terms 'Goal' and 'Goal Setting'

3.2 Explain the significance of Goal setting & Long and Short term goals

3.3 Explain the following concepts

a) Wish b) Dream c) Goal

3.4 Explain the reasons for and consequences of not setting goals

3.5 The SMART features in Goal setting

4.0 Understand the concept of Motivation

4.1 Define 'Motivation' ; Inspiration Vs Motivation

4.2 Importance of motivation in Goal setting

4.3 Distinguish between Internal (Self) Motivation and External Motivation

4.4 De-motivating Factors and how to overcome them

4.5 Motivating oneself and others

5.0 Understand Time Management skills

5.1 Define 'Time Management'

5.2 Comprehend the significance of Time Management

5.3 Explain the Time Quadrant

5.4 Common Time wasters and how to overcome them.

5.5 How to meet deadlines and targets within time

6.0 Understand Critical Thinking

6.1 Define "Critical Thinking"

6.2 Understand the importance of Critical Thinking

6.3 Distinguish between facts and opinions (assumptions)

6.4 Inculcating different perspectives

6.5 Developing Reasoning abilities and form sound judgements

7.0 Understand Creativity

7.1 Understand the importance of and need for creative ideas

7.2 Distinguish between Linear Thinking and Lateral Thinking

7.3 Distinctive qualities of creative people

7.4 Unusual or creative use of familiar objects

7.5 Creative ways of solving problems

8.0 Understand Problem Solving

8.1. Define the concept of Problem solving

8.2 Viewing the problems as challenges

8.3 Different steps in solving a problem

8.4 Selecting the best solution to solve a problem

8.5 Lateral thinking in Problem solving

9.0 Understand Team Work

9.1 Define Team work

9.2 Develop Team skills

9.3 Advantages of team work

9.4 Understand responsibilities as a team player

9.5 Problems of working in a team and possible solutions

10. 0 Understand Leadership

10.1 Define Leadership

10.2 Identify Leadership qualities

10.3 Analyze one's strengths and limitations as a leader

10.4 Types of Leadership: Autocratic and Democratic

10.5 Leadership by example

11.0 Understand Stress Management

11.1 Define Stress

11.2 Explain the causes of stress

11.3 Learn Stress Management skills

11.4 Need for positive thinking and self esteem

11.5 Practice Stress Management strategies

CIVIL ENGINEERING WORK SHOP

Subject title : CIVIL ENGINEERING WORKSHOP

Subject code : C-509

Periods per week : 03

Periods per semester : 45

TIME SCHEDULE

Sl. No.	Major Topic	No. of periods
1	Carpentry	6
2	Bar Bending of steel reinforcement	12
3	Plumbing exercises	12
4	Electrical Exercises	12
5	Demonstration of modern surveying instruments	3
Total		45

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the elements of carpentry in connection with the erection of scaffolding and form work with a particular reference to use of braces

1.1 Study of Carpentry tools
1.2 State various components of scaffolding
1.3 State precautions to be taken while erecting scaffolding
1.4 Explain the method of fixing various elements of scaffolding
1.5 State precautions to be taken to fix the various elements of scaffolding at required position
1.6 Connect various elements of scaffolding
1.7 Explain various aspects of form work to be considered while fixing various elements
1.8 Explain the method of fixing of form work at required position for various elements of building construction
1.9 Connect various elements of formwork

2.0 Understand the skills of bending of reinforcing bars as per the bar bending schedule.

2.1 Identify various tools used for bending of reinforcing bars
2.2 Read the data required from bar bending schedule for bending of bars
2.3 Mark the salient points of location of bending on the bars as per the bar bending schedule

2.4 Bend the bars using the specified tools to the exact shape as per bar bending schedule as specified in IS-2502(Code of practice for bending and fixing of bars for concrete reinforcement)

2.5 Prepare the grills as per the drawings of the structural elements using binders, stirrups, links etc. appropriate to the element

3.0 Understand the elements of plumbing practice and procedure of fixing of various plumbing fixtures

3.1 Identify the different pipe specials and state their functions

3.2 Practice thread cutting on PVC/GI pipes

3.3 Assemble the pipe line for toilet block with taps, showers and wash basins using specific pipe specials

3.4 Fix the floor trap, gully trap and water closet of a house to the drainage pipes

4.0 Understand the various aspects of electrical installations used in buildings and their fixing at appropriate locations

4.1 Identity various electrical accessories, Wires and cables

a. Mains switch
b. MCB
c. Fuse
d. Switches (SPST SPDT)
e. Rotary switch
f .Push Button Switches
g. 2 pin Sockets
h. 3pin /Power sockets
i. Ceiling Rose
j. Lamp Holders
(a) Identify line, neutral and earth terminals in power sockets and power plugs by physical observation and using Tester
k. Use of test lamp

4.2 Identify different wires and cables

a. Know the wire gauge
b. Specifications of electrical wires
c. VIR, PVC, TRS wires
d. Flexible wires and cables
e. Power cords

4.3 Study of earthling and earth pit

4.4 Study of different wiring systems

(a) Open conduit system
(b) Concealed conduit system

4.5 Use of Digital Multimeter to

a. Identify the Range selector

b. Selection of appropriate range to measure

i. AC Voltage
ii. DC Voltage (Battery)
iii. AC Current (Through a lamp/heater)
iv. Check continuity
v. Resistance

4.6 Connect a fuse in the main circuit

a. Know the metals suitable for fuse wire

b. Selecting a correct fuse wire rating for a given electrical load

4.7 Connect a low current (3A) MCB in the circuit and testing

4.8 Control the lamp using a switch

4.9 Control the fan with a switch and regulator

4.10 Connect a i) 2-pin socket ii) 2-pin socket with switch control

4.11 Control one lamp with 2 switches (Staircase wiring)

4.12 Know Power consumption of various Appliances like

1. Tungsten Lamp
2. CFL Lamp
3. Fan
4. Fluorescent lamps (Tube Lights)
5. Air cooler
6. Water heater
7. Geiser
8. Electric Iron

4.13 Estimate the total connected load

4.14 Study of inverter/UPS wiring

4.15 Electrical estimation and costing

4.16 Study of 3-phase system

5.0 Demonstration of modern surveying instruments like Electronic theodelite, EDM and the concept of GIS, GPS

COURSE CONTENT

1. Carpentry

a. Tools used in carpentry
b. Erection of Scaffolding Material
c. Position of Shuttering
d. Fixing of form work.

2. Bar Bending of steel reinforcement

Preparation of bar bending schedule

(a) Bar bending according to given bar bending schedule
(b) Method of bar bending for Earthquake resistant structures
(c) Field visit to automated bar bending

3. Plumbing exercises

a. Thread cutting on GI/PVC pipes
b. Assembling of pipe lines for toilet with two taps, shower and wash basin
c. Fixing of floor traps, gully traps, water closet, drain pipes
d. Laying stoneware/PVC pipes and construction of inspection chambers

4. Electrical Exercises

i. Identity various electrical accessories
ii. Identify line, neutral and earth terminals in power sockets and power plugs
iii. Measure the AC voltage between line and neutral using DMM
iv. Study of earthing and earth pit
v. Study of different wiring systems
    1. Open conduit system
    2. Concealed conduit system
vi. Measurement of the following using DMM
    1. AC Voltage
    2. DC Voltage (Battery)
    3. AC Current (Through a lamp/heater)
    4. Check continuity
    5. Resistance
vii. Connecting a fuse in the main circuit
viii. Controlling the lamp using a switch
ix. Controlling the fan with a switch and regulator
x. Connect a i) 2-pin socket ii) 2-pin socket with switch control
xi. Control one lamp with 2 switches (Staircase wiring)
xii. Study of inverter/UPS wiring
xiii. Electrical estimation and costing
xiv. Study of 3-phase system

5. Demonstration of modern surveying instruments like Electronic theodelite, EDM and the concept of GIS, GPS

VI SEMESTER

C-601 INDUSTRIAL TRAINING
(Practical Training)

VI SEMESTER

Scheme of evaluation:

S.No	Subject	Duration	Items	Max Marks	Remarks
1	Practical Training in the Industry	6 Months	1.First Assessment (at the end of 3rd month)	100	
			2. Second Assessment (at the end of 6th month)	100	
			3.Training report iii) Log Book iv) Report	 30 30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks are 50%.A candidate failing to secure the minimum marks should complete it at his own expenses.

During Industrial training the candidate shall put in a minimum of 90%attendence.

DIPLOMA IN CIVIL ENGINEERING (C-16)

VI SEMESTER

(INDUSTRIAL TRAINING)

Duration: 6 months

OBJECTIVES

Upon completion of practical training in an industry, the student will be able to

1.0 Know the organizational set up from top executive to workmen level
2.0 Know the aspects to be considered during preliminary projects in respect of Irrigation/Road/Rural water supply/Housing colony etc.,
3.0 Know the duties of different officers in the organization
4.0 Know about administrative sanction and technical sanction
5.0 Know various stages of construction
6.0 Knows inspection of form work, reinforcement grills etc.,
7.0 Know the methods of procurement of labour, material and equipment
8.0 Know tenders, contract and contract systems
9.0 Know the need & principles supervision of works
10.0 Know measurement book and muster roll
11.0 Know the preparation, checking and payment of bills
12.0 Know the requirements of a licensed surveyor/contractor/manufacturer of building material(s)

RULES AND REGULATIONS:

1. A candidate shall be assessed twice in the spell of industrial training i.e. at the end of third month and finally before he/she completes the industrial training

2. A candidate shall be assessed twice during the mid spell of industrial training and at the end of industrial training.
3. The assessment shall be carried out by a committee comprising of
   (a) A representative of the Industry where the candidate is undergoing training
   (b) A staff member of the concerned section of the polytechnic.
4. Each assessment should be as per the Assessment scheme listed

ASSESSMENT SCHEME

S. No.	Name of the Parameter	Max. Marks Allotted for each Parameter
1.	Attendance and punctuality	10
2.	General conduct during the period	10
3.	Ability to communicate & human relations	10
4.	Familiarity with materials, tools & machinery	10
5.	Attitude towards job	10
6.	Manual skills	10
7.	Comprehension & Observation	10
8.	Supervising ability	10
9.	Safety and Environmental consciousness	10
10.	Maintenance of dairy	10
	Total:	**100**

5. The remaining 100 marks are to be allotted as follows:

For maintenance of log book 30 marks

For the training report 30 marks,

For seminar / viva-voce 40 marks.

The assessment at the institute level (seminar / viva-voce) is to be done by the following three members individually and be averaged.

(1) Head of Section.
(2) External Examiner preferably from Industry
(3) Staff member who assessed the student during the Industrial Training.

GOVERNMENT OF ANDHRA PRADESH

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

Andhra Pradesh :: Amaravathi

Globally Competetive

CURRICULUM (C-16)

For Polytechnic Diploma Courses
In Andhra Pradesh

DIPLOMA IN MECHANICAL ENGINEERING

Front Cover Page

Objective of the New Curriculum (C-16)

To make the students 'Globally Competetive & Employable' by learning industry relevant subjects & undergoing Industrial training

Suggestions from Industrialists have been incorporated in the Curriculum by organising **Industry Institute Interaction Meet.**

Highlights of the Curriculum (C-16)

- 6 months /1 year industrial training in all the Diploma Courses.
- 1 year industrial training in collaboration with BOAT (Board of Apprenticeship & Training (SR), Chennai).
- Virtual labs for ECE & Computer Branches & Strengthening of Skill Development Centers to provide industrial training to students.

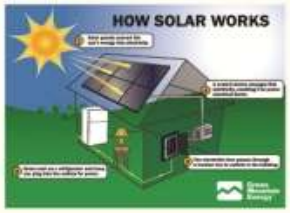
Fundamentals of 'Internet of Things' (IoT) is included for all the Branches in the Subject "Industrial Management & Smart Technologies".

"Communication Skills" and "Life Skills" have been introduced as practical subjects for all the Branches.

Front Cover Page-Inside

"Computer Fundamentals Laboratory" is introduced for all the Branches in First year. AutoCAD specific to the Branch has been given emphasis in the Curriculum.

C Language, Programmable Logic Controllers (PLC), Microcontrollers, Solar Energy are introduced in Electrical Engineering Branch.



Mobile Communications, Consumer Electronics are introduced in Electronics and Communication Branch

CAD/ CAM, CNC Machines, Power Plant Engineering are introduced in Mechanical Engineering Branch.

OOPS through JAVA, Web Designing, Computer Hardware & Networking are introduced in Computer Engineering Branch.

Automobile Chassis and Body Engineering, Recent Trends In Automobile Engineering, Motor Transport Organization etc are introduced in Automobile Engineering Branch.

Back Cover Page-Inside

Journal (JPAP)

The Department of Technical Education, A.P. has a bi- annual 'Journal of Polytechnics of Andhra Pradesh' JPAP

CISCO

CISCO ACADEMIES IN POLYTECHNICS

- 70 Government Polytechnics chosen to have Cisco Academies
- Course Content of CISCO has been incorporated into the ECE and Computer Diploma Courses
- CISCO to train Staff of Polytechnics in two phases to enable them to run the courses effectively
- Students to get 'Certificate from CISCO' along with Diploma Certificate.

Back Cover Page

CURRICULUM-2016
(C-16)

FOR DIPLOMA COURSES IN ANDHRA PRADESH

PREAMBLE

The State Board of Technical Education and Training, Andhra Pradesh under the aegis of the Department of Technical Education, Andhra Pradesh generally reviews the Curricula once in every five years. However, recognizing the needs of the industries and enhancing the employability skills of Polytechnic students, the Government of Andhra Pradesh constituted a committee vide G.O.Rt.No:95 of Higher Education (TE) Dept dated: 29-4-2016 and G.O.Rt.No:98 of Higher Education (TE) Dept dated: 4-5-2016 for updation of polytechnic curriculum under the chairmanship of Sri. S. Balasubrahmanyam, IAS (Retd.,). The committee submitted a report on 31-5-2016 making certain recommendations and suggesting new initiatives to be incorporated in the curriculum. An Industry Institute Interaction Meet was organized with Industry experts and subject experts on 26-12-2016 and the suggestions from Industrialists have also been incorporated in the curriculum. The new Curricula for the different diploma courses have been designed with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh, besides reviewed by Expert Committee constituted with eminent academicians.

The primary objective of the curricular change is to produce best technicians in the country by correlating growing needs of the industries with the academic input.

The revised New Curriculum i.e., Curriculum–2016 (C-16) is approved by BoG of SBTET for its implementation with effect from 2016-17.

Salient Features:

1. Duration of course is either 3 years / 3½ years duration of Regular Academic Instruction.
2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. 6 Months/ 1 year Industrial Training is introduced for all the Diploma courses.
4. Fundamentals of Internet of Things (IOT) is introduced for all the Diploma courses in the subject.

5. Modern subjects relevant to the industry are introduced in all the Diploma courses.
6. CISCO course content has been incorporated into the ECE and CME courses to get certification from CISCO along with Diploma.
7. The policy decisions taken at the State and Central level with regard to environmental science are implemented by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.
8. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the Industries, emphasis is given for learning and acquiring listening, speaking, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are introduced for all the branches.
9. Modern topics relevant to the needs of the industry and global scenario suitable to be taught at Diploma level are also incorporated in the curriculum.
10. AutoCAD specific to the branch has been given more emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
11. Every student is exposed to the computer lab at the 1st year itself in order to familiarize himself with skills required for keyboard/mouse operation, internet usage and e-mailing.
12. Upon reviewing the existing C-14 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In the revised C-16 curriculum, more emphasis is given to the practical content of Laboratories and Workshops, thus strengthening the practical skills.
13. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based.
14. Curricula of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available at the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to conform to the field requirements of industry.
15. The Members of the working group are grateful to Sri G.S. Panda Das, I.A.S., Special Commissioner of Technical Education & Chairman of SBTET, AP. and Sri. Adityanath Das, I.A.S., Principal Secretary of Higher Education for their guidance and valuable inputs in revising, modifying and updating the curriculum.
16. The Members acknowledge with thanks the cooperation and guidance provided by Sri. A.Nirmal Kumar Priya, Secretary, SBTET, Andhra Pradesh and other officials of Directorate of Technical Education and the State Board of Technical Education, Andhra Pradesh, experts from industry, academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

RULES AND REGULATIONS

1 DURATION AND PATTERN OF THE COURSES

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of academic instruction.

All the Diploma courses are run on year wise pattern in the first year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in BM course, the training will be in the seventh semester. Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.

2 PROCEDURE FOR ADMISSION INTO THE DIPLOMA COURSES:

Selection of candidates is governed by the Rules and regulations laid down in this regard from time to time.

a) Candidates who wish to seek admission in any of the Diploma courses will have to appear for Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).

b) The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of making application to the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission

c) Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.

d) For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.
1). D.H.M.C.T. 2).D. Pharmacy

3 MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be English.

4 PERMANENT IDENTIFICATION NUMBER (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for

promotion etc., A Permanent Identification Number (PIN) will be allotted to each admitted candidate to maintain academic records.

5 NUMBER OF WORKING DAYS PER SEMESTER / YEAR:

a). The Academic year for all the Courses shall be in accordance with the Academic Calendar.

b). The Working days in a week shall be from Monday to Saturday

c). There shall be 7 periods of 50 minutes duration on all working days.

d). The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to cover the syllabus.

6 ELIGIBILITY OF ATTENDANCE TO APPEAR FOR THE END EXAMINATION

a). A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.

b). Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.

c). A stipulated fee shall be payable towards condonation for shortage of attendance.

d). Candidates having less than 65% attendance shall be detained.

e). Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered next.

7 READMISSION

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

1. a) Within 15 days after commencement of class work in any semester (Except Industrial Training).

   b) For Industrial Training: before commencement of the Industrial training.

2. Within 30 days after commencement of class works in any year (including D. Pharmacy course or first year course in Engineering and Non Engineering Diploma streams).

Otherwise such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.

The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work, after readmission is granted.

8 SCHEME OF EXAMINATION

a) First Year

THEORY EXAMINATION: Each Subject carries 80% marks with examination of 3 hours duration, along with 20% marks for internal evaluation. (Sessional marks). However, there are no minimum marks prescribed for sessionals.

PRACTICAL EXAMINATION: There shall be 40% Marks for regular practical work done, i.e. sessional marks for each practical subject with an end examination of 3 hours duration carrying 60% marks. However, there are no minimum marks prescribed for sessionals.

b) III, IV, V, VI and VII Semesters:

THEORY EXAMINATION: Each subject carries usually 80 marks and 30 marks in respect of specified subjects of 3hours duration, along with 20 marks for internal evaluation (sessional marks) respectively.

PRACTICAL EXAMINATION: Each subject carry 60/30 marks of 3hours duration 40/20 sessional marks.

9 INTERNAL ASSESSMENT SCHEME

a) Theory Subjects: Theory Subjects carry 20% sessional marks, Internal examinations will be conducted for awarding sessional marks on the dates specified. **Three unit tests will be conducted for I year students and two Unit Tests for semesters.** Average of marks obtained in all the prescribed tests will be considered for awarding the sessional marks.

b) Practical Subjects: Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40% marks in each practical subject. Allotment of marks should be discrete taking into consideration of the students' skills, accuracy, recording and performance of the task assigned to him / her. Each student has to write a record / log book for assessment purpose. In the subject of Drawing, which is also considered as a practical paper, the same rules hold good. Drawing exercises are to be filed in seriatum.

c) Internal assessment in Labs / workshops / Survey field work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Lecturer / Senior Lecturer / Workshop superintendent as the case may be.

d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of Section preferably choosing a qualified person from any local Industry/ nearby Government Polytechnic/ Local Government Organization. Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.

e) Question Paper for Practicals: Question paper should cover all the experiments / exercise prescribed.

f) Records pertaining to internal assessment marks of both theory and practical subjects are to be maintained for official inspection.

g) **In case of Diploma courses *having* Industrial Training**, the training assessment shall be done and the marks are to be awarded in the following manner.

Industrial assessment	:	200 marks (in two spells of 100 marks each)
Maintenance of log book	:	30 marks
Record Work	:	30 marks
Seminar / viva-voce	:	40 marks

TOTAL	:	300 marks

The assessment at the institution level (Seminar/Viva-voce)shall be done by three members, viz., Internal Faculty member, External Examiner and Head of Section and be averaged.

10 MINIMUM PASS MARKS

THEORY EXAMINATION:

For passing a theory subject, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

PRACTICAL EXAMINATION:

For passing a practical subject, a candidate has to secure a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical end

examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand subjects of D.C.C.P course.

11. PROVISION FOR IMPROVEMENT

1. Improvement is allowed only after he / she has completed all the subjects from First Year to Final semester of the Diploma.
2. Improvement is allowed in any 4 (Four) subjects of the Diploma.
3. The student can avail of this improvement chance **ONLY ONCE**, that too within the succeeding two examinations after the completion of Diploma. However, the duration including Improvement examination shall not exceed FIVE years from the year of first admission.
4. No improvement is allowed in Practical / Lab subjects or Project work or Industrial Training assessment. However, improvement in drawing subject(s) is allowed.
5. If improvement is not achieved, the marks obtained in previous Examinations hold good.
6. Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.
7. Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
8. All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued, else the submitted originals will be returned.

12. RULES OF PROMOTION FROM 1ST YEAR TO 3,^{rd,} 4,th 5th ,6th and 7th SEMESTERS:

a) For Diploma Courses of 3 Years duration

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

i) Puts the required percentage of attendance in the 4th semester

ii) Should not have failed in more than Four backlog subjects of 1st year

For IVC & ITI Lateral Entry Students:

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

iv) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she

i) Puts the required percentage of attendance in the 5th semester

ii) Should get eligibility to appear for 4th Semester examination.

For IVC& ITI Lateral Entry students:

i) Puts the required percentage of attendance in the 5th semester
ii) Should not have failed in more than Four backlog subjects of 3rd Semester

v) A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pay the examination fee. A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

A candidate is eligible to appear for 6th semester Industrial Training assessment (Seminar/Viva-voce)

i) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial

Training

ii) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training.
ii) should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. The record of internal assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

b) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT):

1. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.
2. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.
3. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester exam if he/she

i) Puts the required percentage of attendance in the 4th semester
ii) Should not have failed in more than Four backlog subjects of 1st year.

For IVC & ITI Lateral Entry students:

(i) Puts the required percentage of attendance in the 4th semester

4. A candidate shall be promoted to 5th semester industrial training provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the

promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

5. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of attendance, which in this case ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.
6. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 7th semester.
7. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.

A candidate is eligible to appear for 7th semester examination if he/she

i) Puts the required percentage of attendance in the 7th semester
ii) Should get eligibility to appear for 4th semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance in the 7th semester
ii) Should not have failed more than four backlog subjects of 3rd Semester

OTHER DETAILS

a) In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.

b) The I spell of Industrial training shall commence 10 days after the completion of the last theory examination of 4th Semester.

c) The Second spell of Industrial training shall commence within 10 days after the completion of I spell of Industrial training.

c) For Diploma Courses of 3 ½ Years duration (BM):

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

1. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e.

attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

2. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

3. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

   A candidate is eligible to appear for the 4th semester examination if he/she

   i) Puts the required percentage of attendance in the 4th semester

   ii) Should not have failed in more than Four backlog subjects of 1st year

For IVC & ITI Lateral Entry Students:

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

4. A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

   A candidate is eligible to appear for the 5th semester exam if he/she

   i) Puts the required percentage of attendance in the 5 th semester

   ii) Should get eligibility to appear for 4th Semester examination.

For IVC & ITI Lateral Entry students:

iii) Puts the required percentage of attendance in the5th semester
iv) Should not have failed in more than Four backlog subjects of 3rd Semester

5. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.

A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

A candidate is eligible to appear for 6th semester examination

i) Puts the required percentage of attendance in 6th semester and

ii) should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance in 6th semester.
ii) should get eligibility to appear for 5th Semester Examination.

6. A candidate shall be promoted to 7th semester provided he/she puts the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment

(Seminar/Viva-voce) if he/she

i) Puts the required percentage of attendance, ie., 90% in 7th semester Industrial Training
ii) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance, ie., 90% in 7th semester Industrial Training.
ii) Should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. However, the record of internal Assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

OTHER DETAILS

a) In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.

b) The Industrial training shall commence 10 days after the completion of the last theory examination of 6th Semester

13. STUDENTS PERFORMANCE EVALUATION

Successful candidates shall be awarded the Diploma under the following divisions of pass.

1. First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.

2. First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.

3. Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.

   The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.

   In respect IVC & ITI Lateral Entry candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters of study shall be taken into consideration for determining the overall percentage of marks secured by the candidates for award of class/division.

4. Second Class shall be awarded to all students, who fail to complete the Diploma in the regular 3 years/ 3 ½ years and four subsequent examinations, from the year of first admission.

14. EXAMINATION FEE SCHEDULE:

The examination fee should be as per the notification issued by State Board of Technical Education and Training from time to time.

15. STRUCTURE OF END EXAMINATION QUESTION PAPER:

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular subject be considered Examination paper is of 3/6/9 hours duration.

a) Each theory paper consists of Section ‘A’ and Section ‘B’. Section ‘A’ contains 10 short answer questions. All questions are to be answered and each carries 3 marks Max. Marks: 10 x 3 = 30.

Section B contains 8 essay type questions including Numerical questions, out of which 5 questions each carrying 10 marks are to be answered.

Max.Marks: 5 x 10 = 50.

Total Maximum Marks: 80.

b) For Engineering Drawing Subject (107) consist of section 'A' and section 'B'. Section 'A' contains four (4) questions. All questions in section 'A' are to be answered and each carries 5 marks. Max. Marks: 4 x 5=20. Section 'B' contains six (6) questions. Out of which four (4) questions to be answered and each question carries 10 Marks. Max. Marks 4 x 10 = 40.

c) Practical Examinations
For Workshop practice and Laboratory Examinations, Each student has to pick up a question paper distributed by Lottery System.

Max. Marks for an experiment / exercise : 50%

Max. Marks for VIVA-VOCE : 10%

Total : 60% (of total marks for the subject)

In case of practical examinations with 50 marks, the marks will be worked out basing on the above ratio.

In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

16. ISSUE OF MEMORONDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo.

17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA COURSES:

Maximum period for completion of the diploma courses is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

18. ELIGIBILITY FOR AWARD OF DIPLOMA

A candidate is eligible for award of Diploma Certificate if he / she fulfils the

following academic regulations.

i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.

ii. He / she has completed all the subjects.

Students who fail to fulfill all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

For IVC & ITI Lateral Entry students:

i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 academic years.

ii. He / she has completed all the subjects.

Students who fail to fulfill all the academic requirements for the award of the Diploma within 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

1. A candidate desirous of applying for Photo copy of valued answer script/ scripts should apply within prescribed date from the date of the declaration of the result.
2. Photo copies of valued answer scripts will be issued to all theory subjects and Drawing subject(s).
3. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.
4. No application can be entertained from third parties.

B) FOR RE-COUNTING(RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

1. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.
2. Re-verification of valued answer script shall be done for all theory subjects and Drawing subject(s).
3. The Re-verification committee constituted by the Secretary, SBTETAP with subject experts shall re-verify the answer scripts.

I) RE-COUNTING

The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

2) RE-VERIFICATION

(i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.

(ii) Initially single member shall carry out the re-verification.

(iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level ie., for 2-Tier evaluation.

(iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.

(v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:

a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.

b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.

c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.

(vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.

(viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

4. No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

20. MAL PRACTICE CASES:

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

21. DISCREPANCIES/ PLEAS:

Any Discrepancy /Pleas regarding results etc., shall be represented to the SBTETAP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

22. ISSUE OF DUPLICATE DIPLOMA

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed before a First Class Magistrate (Judicial) and *non-traceable certificate* from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training, A.P.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET from time to time.

23. ISSUE OF MIGRATION CERTIFICATE AND TRANSCRIPTS:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

24. GENERAL

i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.

ii. All legal matters pertaining to the State Board of Technical Education and Training are within the jurisdiction of Vijayawada.

iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P is final.

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16

First Year

Sub code	C16-Subjects	No of Periods per week		Total periods per year	Scheme of Examination			
		Theory	Practical		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-101	English	3		90	3	20	80	100
M-102	Engineering Mathematics-I	5		150	3	20	80	100
M-103	Engineering Physics	4		120	3	20	80	100
M-104	Engineering Chemistry & Environmental Studies	4		120	3	20	80	100
M-105	Engineering Mechanics	4		120	3	20	80	100
M-106	Workshop Technology	4		120	3	20	80	100
PRACTICAL								
M-107	Engineering Drawing		6	180	3	40	60	100
M-108	Basic Workshop Practice		6	180	3	40	60	100
M-109	Physics laboratory		1½	45	1½	20	30	50
M-110	Chemistry Laboratory		1½	45	1½	20	30	50
M-111	Computer Fundamentals Laboratory		3	90	3	40	60	100
	T O T A L	**24**	**18**	**1260**		**280**	**720**	**1000**

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16

III Semester

Sub code	C16-Subjects	No of Periods per week		Total periods per semester	Scheme of Examination			
		Theory	Practice		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-301	Engineering Mathematics-II	5		75	3	20	80	100
M-302	Strength of Materials	6		90	3	20	80	100
M-303	Thermal Engineering-I	6		90	3	20	80	100
M-304	Production Technology-I	5		75	3	20	80	100
M-305	Basic Electrical Engineering & Electronics	5		75	3	20	80	100
PRACTICAL								
M-306	Machine Drawing		6	90	3	40	60	100
M-307	Fuels lab and Electrical Engineering Lab		3	45	3	20+20	30+30	100
M-308	Materials testing lab		3	45	3	40	60	100
M-309	Workshop Practice-II		3	45	3	40	60	100
	T O T A L	**27**	**15**	**630**		**260**	**640**	**900**

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16

IV Semester

Sub code	C16-Subjects	No of Periods per week		Total periods per semester	Scheme of Examination			
		Theory	Practice		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-401	Engineering Materials	6		90	3	20	80	100
M-402	Hydraulics and Fluid Power Control Systems	6		90	3	20	80	100
M-403	Thermal Engineering II	6		90	3	20	80	100
M-404	Production technology-II	6		90	3	20	80	100
M-405	Design of Machine Elements	6		90	3	20	80	100
PRACTICAL								
M-406	Production Drawing		3	45	3	40	60	100
M-407	Hydraulics & Fluid Power Control Systems Lab		3	45	3	40	60	100
M-408	Communication Skills		3	45	3	40	60	100
M-409	Thermal Engineering Lab		3	45	3	40	60	100
	T O T A L	**30**	**12**	**630**		**240**	**560**	**800**

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16

V Semester

Sub code	C16-Subjects	No of Periods per week		Total periods per semester	Scheme of Examination			
		Theory	Practice		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-501	Industrial Management & Smart Technologies	5		75	3	20	80	100
M-502	Industrial Engineering - Estimating and Costing	6		90	3	20	80	100
M-503	Refrigeration & Air-conditioning	5		75	3	20	80	100
M-504	Energy sources & Power Plant Engineering	5		75	3	20	80	100
M-505	Computer Aided Manufacturing systems	5		75	3	20	80	100
PRACTICAL								
M-506	Computer Aided Drafting & CNC lab		6	90	3	40	60	100
M-507	Non-Conventional Energy sources and R&AC lab		3	45	3	40	60	100
M-508	Life Skills		3	45	3	40	60	100
M-509	Workshop Practice - III		4	60	3	40	60	100
	T O T A L	**26**	**16**	**630**		**260**	**640**	**900**

M-601 INDUSTRIAL TRAINING
(Practical Training)

VI SEMESTER

Scheme of evaluation:

S.No	Subject	Duration	Items	Max Marks	Remarks
1	M-601 Practical Training in the Industry	6 Months	1.First Assessment (at the end of 3rd month)	100	
			2. Second Assessment (at the end of 6th month)	100	
			3.Training report i) Log Book ii) Report	30 30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks are 50%.A candidate failing to secure the minimum marks should complete it at his own expenses.

During Industrial training the candidate shall put in a minimum of 90%attendence.

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16

First Year

Sub code	C16-Subjects	No of Periods per week		Total periods per year	Scheme of Examination			
		Theory	Practical		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-101	English	3		90	3	20	80	100
M-102	Engineering Mathematics-I	5		150	3	20	80	100
M-103	Engineering Physics	4		120	3	20	80	100
M-104	Engineering Chemistry & Environmental Studies	4		120	3	20	80	100
M-105	Engineering Mechanics	4		120	3	20	80	100
M-106	Workshop Technology	4		120	3	20	80	100
PRACTICAL								
M-107	Engineering Drawing		6	180	3	40	60	100
M-108	Basic Workshop Practice		6	180	3	40	60	100
M-109	Physics lab		1½	45	1½	20	30	50
M-110	Chemistry Lab		1½	45	1½	20	30	50
M-111	Computer Fundamentals Lab		3	90	3	40	60	100
	T O T A L	**24**	**18**	**1260**		**280**	**720**	**1000**

C-16-COMMON-101- ENGLISH
(Common to all Branches)

Subject Title : ENGLISH
Subject Code : Common - 101
Periods per Week : 3
Periods per Year : 90

Time Schedule

Sl No	Major Topics	Titles of the Lessons	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary& Need for English	Lessons 1,2& Regular and essential vocabulary	5	13	1	1
2	Grammar	Lessons 11,12 & 19 to 26	30	31	7	1
3	Reading	Lessons 13 To 18	10	10	-	1
4	Writing	Lessons 27 To 40	30	40	-	4
5	English in Action	Lessons 3 To 10	15	16	2	1
		Total	**90**	**110**	**10**	**08**

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-16 Curriculum the focus is on the special needs of English for technicians.

This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing reports, giving instructions and interpreting graphics/data is of great importance. Therefore the curriculum C-16 focuses on improving communicative abilities equipping the students to become industry-ready and employable.

On completion of this course the student will be able to:

1.0 Build vocabulary in the direction of future needs
2.0 Learn various grammatical structures
3.0 Read and comprehend English and understand the details and draw inferences
4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs
1.1 Locate words, learn spellings, understand meanings
1.2 Pronounce words intelligibly
1.3 Find synonyms and antonyms
1.4 Use affixation
1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures

2.1 Identify and use nouns
2.2 Identify and use pronouns
2.3 Use the present tense
2.4 Use the past tense
2.5 Use the future tense
2.6 Identify and use adjectives
2.7 Identify and use adverbs
2.8 Use prepositions
2.9 Use linkers
2.10 State basic sentence structures
2.11 Construct different types of sentences
2.12 Frame questions to elicit information
2.13 Frame questions for confirmation
2.14 Use active voice
2.15 Use passive voice
2.16 Use direct speech
2.17 Use indirect speech
2.18 Identify and correct errors

3.0 Read and comprehend English

3.1 Identify the main ideas
3.2 Identify the specific details
3.3 Draw inferences
3.4 Give contextual meanings of the words
3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)

4.1 Identify components of a good paragraph
4.2 Write types of paragraphs
4.3 Distinguish between formal and informal letters
4.4 Write personal letters
4.5 Write leave letters
4.6 Write official letters
4.7 Write letters of complaints
4.8 Prepare a resume
4.9 Write a cover letter
4.10 Write short messages
4.11 Report incidents
4.12 Report experiments
4.13 Report Industrial visits
4.14 Write work done statements
4.15 Write maintenance reports
4.16 Make notes using Cue method and Mapping method
4.17 Summarize Paragraphs
4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

Practice spoken communication suited to various situations.

4.19 Use appropriate expressions to greet and take leave
4.20 Use proper expressions to make requests
4.21 Use apt expressions for asking and giving directions
4.22 Use suitable expressions to seek and offer suggestions
4.23 Use suitable expressions to state intentions

4.24 Use suitable expressions to state feelings
4.25 Use appropriate expressions to state agreement and disagreement
4.26 Use proper expressions to make complaints
4.27 Use suitable expressions to express obligations

Course Material

The textbook prepared by the faculty of English of Polytechnics in AP.

Reference Books

1. Essential English Grammar (Intermediate Level)	Raymond Murphy
2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary)	Santanu Sinha Chaudhuri
3. Grammar Builder (Entire Series)	Oxford University Press
4. High School English Grammar (Revised Edition)	Wren and Martin
5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill)	John Langan, Paul Langan
6. Word Power Made Easy	Norman Lewis
7. Spoken English	Shashi Kumar and Dhamija

Engineering Mathematics - I

(Common to all Branches)

Subject Title : Engineering Mathematics - I
Subject Code : Common- 102
Periods per Week : 5
Periods per Year : 150

Time Schedule

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
	Unit - I : Algebra	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
1	Logarithms	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	1/2
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0
	Unit III : Co-ordinate Geometry									
13	Straight Lines	5	3	6	1	1	0	0	0	0
14	Circle	4	2	5	0	0	0	0	1/2	0
15	Conic Sections	4	3	5	0	0	0	0	1/2	0
	Unit – IV : Differential Calculus									

16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
S. No	**Major Topic**	**No of Periods**		**Weightage of Marks**	**Short Type**			**Essay Type**		
	Unit - V : Applications of Differentiation	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
	Total	92	58	110	6	4	0	2	2 1/2	3 1/2
				Marks	18	12	0	20	25	35

R: **Remembering type** 38 marks
U: **Understanding type** 37 marks
App: **Application type** 35 marks

ENGINEERING MATHEMATICS – I
COMMON TO ALL BRANCHES – 102

Objectives

Upon completion of the course the student shall be able to:

UNIT – I

Algebra

1.0 Use Logarithms in engineering calculations

1.1 Define logarithm and list its properties.

1.2 Distinguish natural logarithms and common logarithms.

1.3 Explain the meaning of e and exponential function.

1.4 State logarithm as a function and its graphical representation.

1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

2.1 Define the following fractions of polynomials:

1. Rational,
2. Proper and
3. Improper

2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \dfrac{f(x)}{(x+a)(x+b)(x+c)}$ $\qquad ii)\quad \dfrac{f(x)}{(x+a)^2(x+b)(x+c)}$

$iii)\quad \dfrac{f(x)}{(x^2+a)(x+b)}$ $\qquad iv)\quad \dfrac{f(x)}{(x+a)(x^2+b)^2}$

3.0 Use Matrices for solving engineering problems

3.1 Define a matrix and order of a matrix.

3.2 State various types of matrices with examples (upto 3rd order square matrices).

3.3 Compute sum, scalar multiplication and product of matrices.

3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.

3.5 Define the transpose of a matrix and write its properties.

3.6 Define symmetric and skew-symmetric matrices.

3.7 Resolve a square matrix into a sum of symmetric and skew- symmetric matrices with examples in all cases.

3.8 Define minor, co-factor of an element of 2X2 and 3x3 square matrices with examples.

3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.

3.10 Distinguish singular and non-singular matrices.

3.11 State properties of determinants with simple examples.

3.12 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.

3.13 Compute adjoint and multiplicative inverse of a square matrix.

3.14 Representation of system of linear equations (2 variables in 2 equations and 3 variables in 3 equations) in matrix form.

3.15 Solve system of linear equations using Cramer's rule.

3.16 Solve system of linear equations by matrix inversion method

3.17 State elementary row operations.

3.18 Solve a system of linear equations by Gauss- Jordan method

UNIT – II

Trigonometry :

4.0 Understand Trigonometric Ratios

4.1 Define trigonometric ratios of any angle.

4.2 List the values of trigonometric ratios at specified values.

4.3 Draw graphs of trigonometric functions

4.4 Explain periodicity of trigonometric functions.

5.0 Solve simple problems on Compound Angles

5.1 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B)

5.2 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

5.3 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.,

5.4 Solve simple problems on compound angles.

6.0 Solve problems using the formulae for Multiple and Sub- multiple Angles

6.1 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.

6.2 Derive useful allied formulas like $\sin A = (1 - \cos 2A)/2$ etc.,

6.3 Solve simple problems using the above formulae

7.0 Apply Transformations for solving the problems in Trigonometry

7.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.

8.0 Use Inverse Trigonometric Functions for solving engineering problems

8.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

8.2 Define inverses of six trigonometric functions along with their domains and ranges.

8.3 Derive relations between inverse trigonometric functions so that given A= $\sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.

8.4 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x+\cos^{-1}x = \frac{\pi}{2}$ etc.

8.5 Derive formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right), \quad where\ x \geq 0, y \geq 0, xy < 1$ etc., and solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

9.1 Explain what is meant by solutions of trigonometric equations and find the general solutions of sin x=k, cos x =k and tan x=k with appropriate examples.

9.2 Solve models of the type a $\sin^2 x$ + b sin x +c=0, a cos x + b sin x=c etc., and problems using simple transformations.

10.0 Appreciate Properties of triangles and their solutions

10.1 State sine rule, cosine rule, tangent rule and projection rule.

10.2 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter and sides a, b, c .

10.3 List various formulae for the area of a triangle.

10.4 Solve problems using the above formulae.

10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

11.1 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.

11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

12.1 Define complex number, its modulus , conjugate and list their properties.

12.2 Define the operations on complex numbers with examples.

12.3 Define amplitude of a complex number

12.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.

12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT - III

Coordinate Geometry

13.0 Solve the problems on Straight lines

13.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form

13.2 Solve simple problems on the above forms

13.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

14.0 Solve the problems on Circles

14.1 Define locus of a point – circle and its equation.

14.2 Find the equation of a circle given

(i) Center and radius

(ii) Two ends of a diameter

(iii) Centre and a point on the circumference

(iv) Three non collinear points

14.3 Write the general equation of a circle and find the centre and radius.

15.0 Appreciate the properties of Conics in engineering applications

15.1 Define a conic section.

15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.

15.3 Find the equation of a conic when focus, directrix and eccentricity are given

15.4 Describe the properties of Parabola, Ellipse and Hyperbola in standard form.

UNIT - IV

Differential Calculus

16.0 Use the concepts of Limit and Continuity for solving the problems

16.1 Explain the concept of limit and meaning of $\lim_{x \to a} f(x) = l$ and state the properties of limits.

16.2 Mention the Standard limits $\lim_{x \to a} \frac{x^n - a^n}{x - a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to 0} \frac{\tan x}{x}$, $\lim_{x \to 0} \frac{a^x - 1}{x}$, $\lim_{x \to 0} \frac{e^x - 1}{x}$, $\lim_{x \to 0} (1 + x)^{\frac{1}{x}}$, $\lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x$ (All without proof).

16.3 Solve the problems using the above standard limits

16.4 Evaluate the limits of the type $\lim_{x \to l} \frac{a x^2 + b x + c}{\alpha x^2 + \beta x + \gamma}$ and $\lim_{x \to \infty} \frac{f(x)}{g(x)}$

16.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

17.0 Appreciate Differentiation and its meaning in engineering situations

17.1 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

17.2 State the significance of derivative in scientific and engineering applications.

17.3 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

17.4 Find the derivatives of simple functions from the first principle .

17.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

17.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

(i) $\sqrt{t^2 + \frac{2}{t}}$ **(ii)** $x^2 \sin 2x$ **(iii)** $\frac{x}{\sqrt{x^2 + 1}}$ **(iv)** $\log(\sin(\cos x))$.

17.7 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

17.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

17.9 Find the derivatives of hyperbolic functions.

17.10 Explain the procedures for finding the derivatives of implicit function with examples.

17.11 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.

17.12 Explain the concept of finding the higher order derivatives of second and third order with examples.

17.13 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.

17.14 Explain the definition of Homogenous function of degree n

17.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT - V

Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

18.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.

18.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

18.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x).

18.4 Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

19.0 Understand the Physical Applications of Derivatives

19.1 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

19.2 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

20.0 Use Derivatives to find extreme values of functions

20.1 Define the concept of increasing and decreasing functions.

20.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

20.3 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima.

20.4 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

21.0 Use Derivatives to find Errors and Approximations

21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

COURSE CONTENT

Unit-I

Algebra

1. Logarithms :

   Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions :

   Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

$$i)\quad \frac{f(x)}{(x+a)(x+b)(x+c)} \qquad ii)\quad \frac{f(x)}{(x+a)^2(x+b)(x+c)}$$

$$iii)\quad \frac{f(x)}{(x^2+a)(x+b)} \qquad iv)\quad \frac{f(x)}{(x+a)(x^2+b)^2}$$

Matrices:

3. Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 2 or 3 variables-Solutions by Cramer's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry :

4. Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. Compound angles: Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.
6. Multiple and sub multiple angles: trigonometric ratios of multiple angles 2A,3A and submultiple angle A/2 with problems.
7. Transformations of products into sums or differences and vice versa simple problems
8. Inverse trigonometric functions : definition, domains and ranges-basic properties- problems.
9. Trigonometric equations: concept of a solution, principal value and general solution of trigonometric equations :

   sin x =k , cos x= k, tan x =k.

Solutions of simple quadratic equations, equations involving usage of transformations- problems.

10. Properties and solutions of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- solving a triangle- problems.
11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
12. Complex Numbers: Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form (Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III

Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of a point, Circle definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points - general equation of a circle - finding center, radius.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms.

UNIT-IV

Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems-Continuity of a function at a point- Simple Examples only.
17. Concept of derivative- definition (first principle) - different notations-derivatives of elementary functions - problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point. Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.

20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

Reference Books :

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS

Subject Title : Engineering Physics
Subject Code : Common -103
Periods per week : 04
Total periods per year : 120

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	12	13	1	1
3.	Kinematics	14	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	12	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	12	13	1	1
11.	Modern Physics	08	03	1	-
	Total:	**120**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

1.1 Explain the concept of Units
1.2 Define the terms
a) Physical quantity, b) Fundamental physical quantities and
c) Derived physical quantities
1.3 Define unit
1.4 Define fundamental units and derived units
1.5 State SI units with symbols
1.6 State Multiples and submultiples in SI system
1.7 State Rules of writing S.I. units
1.8 State advantages of SI units
1.9 Define Dimensions
1.10 Write Dimensional formulae
1.11 Derive dimensional formulae of physical quantities
1.12 List dimensional constants and dimensionless quantities
1.13 State the principle of Homogeneity of Dimensions
1.14 State the applications of Dimensional analysis
1.15 State the limitations of dimensional analysis
1.16 Solve problems

2.0 Understand the concept of Elements of Vectors

2.1 Explain the concept of Vectors
2.2 Define Scalar and Vector quantities
2.3 Give examples for scalar and vector quantities
2.4 Represent vectors graphically
2.5 Classify the Vectors
2.6 Resolve the vectors

2.7 Determine the Resultant of a vector by component method
2.8 Represent a vector in space using unit vectors (I, j, k)
2.9 State triangle law of addition of vectors
2.10 State parallelogram law of addition of vectors
2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
2.12 Derive expression for magnitude and direction of resultant of two vectors
2.13 State polygon law of addition of vectors
2.14 Explain subtraction of vectors
2.15 Define Dot product of two vectors with examples (Work done, Power)
2.16 Mention the properties of Dot product
2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
2.18 Mention the properties of Cross product.
2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

3.1 Write the equations of motion in a straight line
3.2 Explain the acceleration due to gravity
3.3 Derive expressions for vertical motion
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.5 Explain projectile motion with examples
3.6 Explain Horizontal projection
3.7 Derive an expression for the path of a projectile in horizontal projection
3.8 Explain oblique projection
3.9 Derive an expression for the path of projectile in oblique projection
3.10 Derive formulae for projectile in oblique projection
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
e) Horizontal Range, f) Maximum range
3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

4.1 Define friction
4.2 Classify the types of friction and define
4.3 Explain the concept of Normal reaction
4.4 State the laws of friction
4.5 Define coefficients of friction
4.6 Explain the Angle of friction
4.7 Derive an expression for acceleration of a body on a rough horizontal surface
4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
4.9 Define Angle of repose
4.10 Derive expressions for acceleration of a body on a smooth inclined plane (up and down)
4.11 Derive expressions for acceleration of a body on a rough inclined plane (up and down)
4.12 List the Advantages and Disadvantages of friction
4.13 Mention the methods of minimizing friction
4.14 Solve the related numerical problems

5.0 Understand the concepts of Work, Power, and Energy

5.1 Define the terms 1.Work, 2. Power and Energy
5.2 State SI units and dimensional formulae for 1.Work, 2. Power, and Energy
5.3 Define potential energy and state examples
5.4 Derive the expression for Potential energy
5.5 Define kinetic energy and state examples

5.6 Derive the expression for kinetic energy
5.7 State and derive Work- Energy theorem
5.8 Derive the relation between Kinetic energy and momentum
5.9 State the law of conservation of energy and mention examples
5.10 Verify the law of conservation of energy in the cases of a freely falling body and vertically projected body in the upward direction
5.11 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

6.1 Define Simple harmonic motion
6.2 Give examples for Simple harmonic motion
6.3 State the conditions of Simple harmonic motion
6.4 Explanation of SHM in terms of projection of circular motion on any one of the diameters of the circular path
6.5 Derive expression for displacement
6.6 Derive expression for velocity
6.7 Derive expression for acceleration
6.8 Derive expression for Time period and frequency of S H M
6.9 Define phase of S H M and explain from the expression of displacement
6.10 Define Ideal simple pendulum and derive expression for Time period of simple pendulum
6.11 State the laws of motion of simple pendulum and mention formulae
6.12 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

7.1 Explain the concept of expansion of gases
7.2 State and explain Boyle's law and also express it in terms of density
7.3 Define absolute zero temperature
7.4 Explain absolute scale of temperature
7.5 State Charles laws in terms of absolute temperature and explain
7.6 Define ideal gas and distinguish from real gas
7.7 Derive Ideal gas equation
7.8 Define Specific gas constant and Universal gas constant
7.9 Explain why universal gas constant is same for all gases
7.10 State SI unit and dimensional formula of universal gas constant
7.11 Calculate the value of universal gas constant
7.12 State the gas equation in different forms (as a function of density and mass)
7.13 Distinguish between r and R
7.14 State and Explain Isothermal process
7.15 State and Explain adiabatic process
7.16 Distinguish between isothermal and adiabatic processes
7.17 State first and second laws of thermodynamics and state applications
7.18 Define specific heats & molar specific heats of a gas and differentiate them
7.19 Derive the relation $C_p - C_v = R$ (Mayer's Equation)
7.20 Solve the relavent numerical problems

8.0 Understand the concept of Sound

8.1 Define the term sound
8.2 Explain longitudinal and transverse wave motion and state differences
8.3 Distinguish between musical sound and noise
8.4 Explain noise pollution and state SI unit for intensity level of sound
8.5 Explain causes of noise pollution
8.6 Explain effects of noise pollution
8.7 Explain methods of minimizing noise pollution
8.8 Explain the phenomenon of beats
8.9 State the applications of beats

8.10 Define Doppler effect
8.11 List the Applications of Doppler effect
8.12 Define reverberation and reverberation time
8.13 Write Sabine's formula and name the parameters contained
8.14 Define and Explain echoes and also state its applications
8.15 State conditions of good auditorium
8.16 Solve the related numerical problems

9.0 Understand the properties of matter

9.1 Define the term Elasticity
9.2 Define the terms stress and strain and also define different types of stress and strain
9.3 State the units and dimensional formulae for stress and strain
9.4 State and explain Hooke's law
9.5 Define surface tension and state examples
9.6 Explain Surface tension with reference to molecular theory
9.7 Define angle of contact
9.8 Define capillarity
9.9 Write the formula for surface tension based on capillarity and name the parameters
9.10 Explain the concept of Viscosity
9.11 Mention examples of Viscosity
9.12 State Newton's formula for viscous force and explain
9.13 Define co-efficient of viscosity and write its units and dimensional formula
9.14 Explain the effect of temperature on viscosity of liquids and gases
9.15 State Poiseulle's equation for Co-efficient of viscosity and name the physical quantities involved
9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

10.1 Explain the concept of Electricity
10.2 State Ohm's law and write the formula
10.3 Explain Ohm's law
10.4 Define specific resistance, conductance and state their units
10.5 State Kichoff's laws
10.6 Explain Kichoff's laws
10.7 Describe Wheatstone's bridge with legible sketch
10.8 Derive an expression for balancing condition of Wheatstone's bridge
10.9 Describe Meter Bridge experiment for the determination of resistivity with a neat circuit diagram
10.10 Write the formula in Meter Bridge to determine specific resistance
10.11 Explain the concept of magnetism
10.12 State the Coulomb's inverse square law of magnetism
10.13 Define magnetic field and magnetic lines of force and write the properties of magnetic lines of force
10.14 State the Magnetic induction field strength and mention its units and dimensionsal formula
10.15 Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field
10.16 Derive Magnetic induction field strength at a point on the axial line
10.17 Derive Magnetic induction field strength at a point on the equatorial line
10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

11.1 State and Explain Photo-electric effect
11.2 Write Einstein's photoelectric equation and explain
11.3 State laws of photoelectric effect

11.4 Explain the Working of photoelectric cell
11.5 List the Applications of photoelectric effect
11.6 Recapitulate refraction of light and its laws
11.7 Define critical angle
11.8 Explain the Total Internal Reflection
11.9 Explain the principle and working of Optical Fiber
11.10 Mention types of optical fibbers
11.11 List the applications of Optical Fiber
11.12 Define super conductor and superconductivity and mention examples for superconductors
11.13 State the properties of superconducting materials
11.14 List the applications of superconductors

COURSE CONTENT

1. Units and Dimensions:
Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units-Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Advantages and limitations of Dimensional analysis- - Problems.

2. Elements of Vectors:
Scalars and Vectors –Types of vectors(Proper Vector, Null Vector, Unit Vector, Equal , Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors–Subtraction of vectors- Dot and Cross products of vectors-Problems

3. Kinematics
Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range - problems

4. Friction:
Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction— Motion of a body over a horizontal surface- smooth inclined plane- rough inclined plane- Advantages and disadvantages of friction- Methods of reducing friction – Problems

5. Work, Power and Energy:
Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy- Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems

6. Simple Harmonic Motion:
Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum- Problems

7. Heat and Thermodynamics:
Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between r and R- Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats - molar specific heats of a gas –Derivation of Mayer's Equation- Problems

8. Sound:

Sound- Nature of sound- Types of wave motion -musical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Conditions of good auditorium- Problems

9. **Properties of matter**

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law- Definition of surface tension-Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseuille's equation for Co-efficient of viscosity- The related numerical problems

10. Electricity & Magnetism:

Ohm's law and explanation- Specific resistance- Kirchoff's laws- Wheatstone's bridge - Meter bridge- Coulomb's inverse square law magnetic field- magnetic lines of force- Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line –problems.

11. Modern Physics;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect- Total internal reflection- fiber optics- -principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- superconductivity - applications

REFERENCE BOOKS

1. Intermediate physics Volume-I & 2	Telugu Academy (English version)
2. Unified physics Volume 1,2,3 and 4	Dr.S.L Guptha and Sanjeev Guptha
3. Text book of physics Volume I	Resnick & Holiday
4. Text book of applied physics	Dhanpath Roy
5. Fibre optics	D.A Hill
6. NCERT Text Books	XI & XII Standard

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	14	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	12	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	12	13	0	1	0	0	1	0
11.	Modern Physics	08	03	1	0	0	0	0	0
	Total:	**120**	**110**	**3**	**5**	**2**	**22**	**5**	**1**

C – 16, ENGINEERINGCHEMISTRY &ENVIRONMENTALSTUDIES
(Common to all Branches)

Subject Title : Engineering Chemistry & Environmental Studies
Subject Code : Common-104
Periods per week : 04
Total periods per year : 120

Time Schedule

S.No	Major topic	No of Periods	Weightage of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
A. ENGINEERING CHEMISTRY										
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
B. ENVIRONMENTALSTUDIES		18	16	1	1	0	0	1	0	
total		120	110	6	2	2	3	3 1/2	1 1/2	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A.ENGINEERINGCHEMISTRY

1.0 Understand the concept of Atomic structure

1.1 Explain the charge and mass of fundamental particles of an atom (electron, proton and neutron)
1.2 Explain the concept to f atomic number and mass number.
1.3 State the Postulates of Bohr's atomic theory and its limitations.
1.4 Explain the significance of four Quantum numbers.
1.5 Explain 1. Aufbau principle, 2 Pauli's exclusion principle 3 Hund's rule.
1.6 Define Orbital in an atom.
1.7 Draw the shapes of s,pandd - Orbitals .
1.8 Distinguish between Orbit and Orbital
1.9 Write the electronic configuration of elements up to atomic number 30
1.10 Explain the significance of chemical bonding
1.11 Explain the Postulates of Electronic theory of valency

1.12 Define the types of Chemical bonding viz., Ionic, Covalent bonds.
1.13 Explain the types of Chemical bonding viz., Ionic, Covalent bonds with examples.
1.14 Explain bond formation in NaCl and MgO.
1.15 List Properties of Ionic compounds
1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method.
1.17 List Properties of Covalent compounds
1.18 Distinguish between properties of ionic compounds and covalent compounds.
1.19 Structures of ionic solids-define a) Unit cell b) co-ordination number.
1.20 Structures of Unit cells of NaCl and CsCl.
1.21 Define the term. Oxidation number.
1.22 Calculate the Oxidation Number of underlined atoms in the following examples
a)K$\underline{Mn}O_4$ b) $K_2\underline{Cr}_2O_7$ c) H$\underline{N}O_3$ d) $H_2\underline{S}O_4$ e) $\underline{Cl}O_4^-$ f) $\underline{N}H_4^+$
1.23 Differentiate between Oxidation Number and Valency

2.0 Calculate Molarity and Normality of given Solution
2.1 Define the terms 1.Solution, 2.Soluteand 3.Solvent
2.2 Classify solutions based on physical state and solubility
2.3 Define mole
2.4 Problems on 'Mole concept'
2.5 Define the terms 1. Atomic weight, 2.Molecular weight and 3. Equivalent weight
2.6 Calculate Molecular weight and Equivalent weight of given Acids,($HCl, H_2SO_4 HNO_3$)Bases (NaOH, KOH, $Ca(OH)_2$) and Salts (NaCl, Na_2CO_3, $CaCO_3$)
2.7 Define 1.Molarity, 2.Normality of solutions
2.8 Solve Numerical problem son Molarity and Normality
a) calculate the Molarity or Normality if weight of solute and volume of solution are given
b) calculate the weight of solute if Molarity or normality with volume of solution are given
c) problems on dilution to convert high concentrated solutions to low concentrated solutions

3.0 Understand the concepts of Acids and bases
3.1 Explain Arrhenius theory of Acids and Bases
3.2 State the limitations of Arrhenius theory of Acids and Bases
3.3 Explain Bronsted – Lowry theory of acids bases
3.4 State the limitations of Bronsted – Lowry theory of acids bases
3.5 Explain Lewis theory of acids and bases
3.6 State the limitations of Lewis theory of acids and bases
3.7 Explain the Ionic product of water
3.8 Define pH and explain Sorens on scale
3.9 Solve the Numerical problems on pH(Strong Acids and Bases)
3.10 Define Buffer solution
3.11 Give atleast three examples for Buffer solutions
3.12 State the applications of Buffer solution

4.0 Understand the Principles of Metallurgy
4.1 List at least eight Characteristics of Metals
4.2 Distinguish between Metals and Non Metals
4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4.Fluxand 5.Slag
4.4 Describe the methods of concentration of Ore; 1.Handpicking,2.Levigation, and 3. Froth Floatation
4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.
4.6 Explain the purification of Metals by Electrolytic Refining
4.7 Define an Alloy
4.8 Write the Composition of the following alloys:1.Brass, 2. Germansilver,3 Nichrome
4.9 List the uses of the following Alloys: 1. Brass, 2.Germansilver, 3.Nichrome

5.0 Understand the concepts of Electrochemistry

5.1 Define the terms1. Conductor, 2. Insulator, 3.Electrolyte 4.Non–electrolyte
5.2 Distinguish between metallic conduction and Electrolytic conduction
5.3 Explain electrolysis by taking example fused NaCl
5.4 Explain Faraday's laws of electrolysis
5.5 Define 1.Chemical equivalent (E) 2.Electrochemicalequivalent (e) and their relation.
5.6 Solve the Numerical problems based on Faraday's laws of electrolysis
5.7 Define Galvanic cell
5.8 Explain the construction and working of Galvanic cell
5.9 Distinguish between electrolytic cell and galvanic cell
5.10 Explain the electrode potentials and standard electrode potentials
5.11 Explain the electro chemical series and its significance
5.12 Explain the emfofa cell.
5.13 Solve the numerical problems on emfof the cell based on standard electrode potentials.

6.0 Understand the concept of Corrosion

6.1 Define the term corrosion
6.2 state the Factors influencing the rate of corrosion
6.3 Describe the formation of a)composition cell, b)stress cell ,c) concentration cell during corrosion.
6.4 Define rusting of iron and Explain the mechanism of rusting of iron.
6.5 Explain the methods of prevention of corrosion:
a)Protective coatings (anodic and cathodic coaitings)
b) Cathodic protection(Sacrificial anode process and Impressed–voltage process)

7. 0 Understand the concept of Water Technology

7.1 State the various Sources of water like Surface water and sub-surface water.
7.2 Define the terms soft water and hard water with respect to soap consumption.
7.3 Define the term hardness of water
7.4 Types of hardness of water 1.Temporary hardness 2. Permanent hardness
7.5 List the salts that causing hardness of water(with Formulae)
7.6 State the disadvantages of using hard water in industries
7.7 Define Degree of hardness, units of hardness(mg/L) or ppm.
7.8 Explain the methods of softening of hard water:a) Ion-Exchange process, b)Permutit process or zeolite process
7.9 Concept of Osmosis and Reverse Osmosis with examples .
7.10 State the applications of Reverse Osmosis.
7.11 State essential qualities of drinking water.

8.0 Understand the concepts of Polymers

8.1 Explain the concept of polymerisation
8.2 Describe the methods of polymerization a) addition polymerization of Ethylene b)condensation polymerization of phenol and formaldehyde(Only flow chart i.e. without chemical equations)
8.3 Define the term plastic
8.4 Classify the plastics with examples
8.5 Distinguish between the rmo and thermo setting plastics
8.6 List the Characteristics of plastics
8.7 State the advantages of plastics over traditional materials
8.8 State the disadvantages of using plastics.
8.9 Explain the methods of preparation of the following plastics:
1.Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde
8.10 Explain the uses of the following plastics:
1.Polythene, 2. PVC, 3.Teflon, 4.Polystyrene and 5. Urea formaldehyde
8.11 Define the term natural rubber

8.12 write the structural formula of Natural rubber
8.13 Explain the processing of Natural rubber from latex
8.14 List the Characteristics of natural rubber
8.15 Explain the process of Vulcanization
8.16 List the Characteristics of Vulcanized rubber
8.17 Define the term Elastomer
8.18 Describe the preparation of the following synthetic rubbers a) Buna-s and b)Neo prene rubber
8.19 List the uses of the following synthetic rubbers a) Buna-s and b)Neo prene rubber

9.0 Understand the concepts of Fuels
9.1 Define the term fuel
9.2 Classify the fuels based on physical state–solid, liquid and gaseous fuels,
9.3 Classify the fuels based on occurrence-primary and secondary fuels
9.4 List the characteristics of good fuel
9.5 State the composition and uses of gaseous fuels:
a)water gas, b)producer gas, c)natural gas, d)coal gas, e)Biogas and f) acetylene

B. ENVIRONMENTAL STUDIES
1.1 Define the term environment
1.2 Explain the scope and importance of environmental studies
1.3 Segments of environment 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere,
1.4 Define the following terms 1)Pollutant, 2).Pollution, 3).Contaminant, 4)receptor, 5)sink, 6) particulates, 7)dissolved oxygen, 8)Threshold limit value, 9).BOD, and 10).COD 11) eco system
1.5 State the renewable and non renewable energy sources with examples.
1.6 Define the terms:
1).Producers, 2).Consumers and 3).Decomposers with examples.
1.7 Explain bio diversity and threatst obiodiversity
1.8 Define air pollution
1.9 Classify the air pollutants-based on origin and physical state of matter.
1.10 Explain the causes of Air pollution.
1.11 Explain the effects of air pollution on human beings, plants and animals.
1.12 State the uses of forest resources.
1.13 State the deforestation and its causes and effects.
1.14 Explain the 1.) Green house effect , 2) Ozone layer depletion and 3) Acidrain.
1.15 Explain the methods of control of Air pollution
1.16 Define Water pollution
1.17 Explain the causes of Water pollution
1.18 Explain the effects of Water pollution on living and Non-living things.
1.19 Explain the methods of control of Water pollution.

COURSE CONTENT

A. ENGINEERING CHEMISTRY

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers – Aufbau principle - Hund's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples–Properties of Ionic and Covalent compounds- structures of ionic crystals NaCl, CsCl. ,**Oxidation Number**- calculations, differences between Oxidation Number and Valency.

2. Solutions

Introduction-concentration methods – Mole concept, Molarity, Normality, Equivalent weights, Numerical problems on Mole, Molarity and Normality.

3. Acids and Bases

Introduction – Theories of acids and bases and limitations – Arrhenius theory-Bronsted –Lowry theory – Lewis acid base theory – Ionic product of water– pH and related numerical problems– Buffer solutions–Applications.

4. Principles of Metallurgy

Characteristics of Metals and distinction between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. Electrochemistry

Conductors, insulators, electrolytes– electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electrochemical series–emf and numerical problems on emfofa cell

6. Water technology

Introduction–soft and hard water–causes of hardness–types of hardness
–dis advantages of hard water – degree of hardness (ppm) – softening methods – permut it process – ion exchange process– drinking water –Osmosis, Reverse Osmosis –Applications of Reverse osmosis

7. Introduction - factors influencing corrosion - composition, stress and concentration cells–rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics – preparationandusesofthefollowingplastics:1.Polythene 2.PVC 3.Teflon 4.Polystyrene 5. Urea formal dehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers, Buna-s, Neoprene rubber and their uses.

9. Fuels

Definition and classification of fuels–characteristics of good fuel-composition and uses of gaseous fuels.

B. ENVIRONMENTALSTUDIES

Introduction– environment –scope and importance of environmental studies important terms– renewable and non-renewable energy sources–Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Bio diversity.
Air pollution – causes-Effects– forest resources: uses and over exploitation, deforestation, acid rain, greenhouse effect –ozone depletion – control of air pollution – Water pollution – causes – effects – control measures,

REFERENCEBOOKS

1. Intermediate chemistry Vol 1&2 Telugu Academy
2. Intermediate chemistry Vol 1&2 Vikram Publishers
3. Intermediate chemistry Vol 1&2 Vignan Publishers &Deepthi Publishers
4. Engineering Chemistry Jain & Jain
5. Engineering Chemistry O.P. Agarwal, Hi-Tech.
6. Engineering Chemistry Sharma
7. Engineering Chemistry A.K. De

ENGINEERING MECHANICS

Subject Title : Engineering Mechanics
Subject Code : M-105
Periods/Week : 04
Periods per year : 120

Time Schedule

Sno	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay type Questions
1	Statics	22	21	02	1 ½
2	Friction	18	16	02	01
3	Geometrical properties of sections	22	18	01	1 ½
4	Dynamics	28	26	02	02
5	Simple machines	20	21	02	1 ½
6	Basic Link Mechanisms	10	08	01	½
	Total	**120**	**110**	**10**	**08**

OBJECTIVES

On completion of the study of the subject a student will be able to

1) Understand the concept of Statics

a) Explain the meaning of mechanics in engineering
b) State the importance of mechanics in engineering
c) State the system of units used
d) Explain the concept of force
e) List the types of forces
f) Explain the force systems
   i) Co-planar and Non-coplanar
   ii) Parallel and Non-Parallel
   iii) Like and Unlike
   iv) Concurrent and Non-concurrent
g) Explain the concept of equilibrium
h) State the parallelogram law of forces
i) State the triangle law of forces
j) State the polygon law of forces
k) State Lami's theorem
l) Explain the concept of free body diagram
m) Solve the problems involving concurrent coplanar forces
n) Solve simple problems involving non-concurrent coplanar forces
o) Solve simple problems using Lami's theorem
p) Define the terms couple and moment of couple
q) Explain the properties of a couple
r) State the condition of equilibrium of a body acted upon by co-planarforces

2) Understand the concept of Friction

a) Explain the concept of friction
b) State the laws of friction
c) Identify the machine members in which friction exists
d) Resolve the forces acting on bodies moving on horizontal plane

e) Resolve the forces acting on bodies moving along the inclined planes
f) Solve the related numerical problems

3) Understand the Geometric Properties of Sections

a) Define the terms centre of gravity, centre of mass and Centroid
b) State the need for finding the Centroid and centre of gravity for various engineering applications
c) Locate the C.G. of a given section
d) Explain the method of determining the Centroid by 'Method of moments'
e) Determine the position of Centroid of standard sections T, L, I, Channel section, Z-section, unsymmetrical I section
f) Determine the position of Centroid of built up sections
g) Explain the meaning of the term moment of Inertia
h) Define the term polar moment of inertia
i) Explain the term radius of gyration
j) State the necessity of finding Moment of Inertia for various engineering applications
k) Determine Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z- section, unsymmetrical I section
l) State Parallel axis theorem and perpendicular axis theorem
m) Determine M.I of standard sections by applying parallel axes theorem
n) Determine M.I of standard sections by applying perpendicular axes theorem
o) Calculate the moment of Inertia of composite sections
p) Calculate radius of gyration of standard sections
q) Determine the polar M.I for solid and hollow circular section applying perpendicular axes theorem
r) Solve the related numerical problems

4) Understand the concept of Dynamics

a) Define the terms Kinematics and Kinetics
b) Classify the motion types
c) Define the terms displacement, velocity and acceleration
d) State the Newton's Laws of motion (without derivation)
e) Solve the problems related to the rectilinear motion of a particle
f) Explain the motion of projectile
g) Solve numerical problems on projectiles
h) State D'Alembert's principle
i) Define the law of conservation of energy
j) Explain the Work-Energy principle
k) Define the law of conservation of momentum
l) Explain the Impulse –momentum equation
m) Solve problems using the above principles
n) Explain the rotary motion of a particle
o) Define centripetal force
p) Define centrifugal force
q) Differentiate between centripetal and centrifugal forces
r) Describe simple harmonic motion
s) Name the Engineering applications of simple harmonic motion

5) Comprehend the Principles involved in Simple Machines

a) Define the important terms of simple machines
   i) Machine
   ii) Mechanical Advantage
   iii) Velocity Ratio
   iv) Efficiency
b) Illustrate the three classes of simple lever
c) Show that an inclined plane is a simple machine to reduce the effort in lifting loads
d) Derive expression for VR in cases of

i) Wheel & axle
ii) Weston Differential pulley blocks
iii) Pulleys
iv) Worm & Worm wheel
v) Winch crabs
vi) Screw jack
vii) Rack & pinion

e) Compute the efficiency of a given machine
f) Interpret the law of machine
g) State the conditions for self-locking and reversibility
h) Calculate effort lost in friction and load equivalent of friction
i) Evaluate the conditions for maximum M.A.& Maximum efficiency

6) Understand the concept of Basic Link mechanisms

a) Define important terms of basic link mechanisms
i) Link
ii) Kinematic pair
iii) Kinematic chain
iv) Mechanism, structure & machine
b) Explain kinematic pair and kinematic chain with the help of sketches
c) Give examples for Lower and Higher pairs
d) Give examples of inversion

COURSE CONTENT

1) Statics

The meaning of word mechanics - Application of Mechanics to Engineering - System of Units - Definition and specification of force - System of forces - Resolution of force - Equilibrium and Equilibrant - Statement of Parallelogram law of forces, Triangle law of forces, Polygon law of forces and Lami's theorem - Drawing the free body diagram - Numerical problems related to concurrent coplanar forces - Couple and moment of a couple - Condition for equilibrium of a rigid body subjected to number of coplanar non-concurrent forces - Related Numerical problems

2) Friction

Definition of static friction, dynamic friction and impending friction - Laws of solid and liquid friction - Derivation of limiting angle of friction and angle of repose - Resolution of forces considering friction when a body moves on horizontal plane - Resolution of forces considering friction when a body moves on inclined plane - Numerical examples on the above cases

3) Geometric Properties of Sections

Definition and explanation of the terms centre of gravity, centre of mass and Centroid - Centroid of square, rectangle, triangle, semi-circle and trapezium (formulae only without derivations) - Centre of gravity of composite sections by analytical method (T-Section, L-Section I-section and channel section only) - Moment of Inertia - Definition and explanation - Theorems of Moment of Inertia - i) Parallel axes theorem ii) Perpendicular axes theorem - Moment of Inertia for simple Geometrical Sections, Rectangular, circular and triangular section - Radius of Gyration - Calculation of Moment of Inertia and Radius of Gyration of I–Section, Channel Section, T–Section,L–Section (Equal & unequal lengths), Z–section, Built up Sections (Simple cases only)

4) Dynamics

Definition of Kinematics and Kinetics - Classification of motion - Definition of displacement, velocity and acceleration - Newton's Laws of motion (without derivation) - Solving the problems

related to the rectilinear motion of a particle - Motion of projectile and solving the numerical problems - D'Alembert's principle - Law of conservation of energy - Work-Energy principle - Law of conservation of momentum - Impulse–momentum equation - Solving problems using the above principles - Rotary motion of particle - laws of rotary motion - Definition of centripetal and centrifugal forces - differentiation between the two - Simple harmonic motion - Definition of the terms frequency, time period, amplitude and frequency - SHM equation, natural frequency - Simple problems on SHM

5) Simple Machines

Definition of simple machine - uses of simple machine - levers and inclined plane - Fundamental terms like mechanical advantage, velocity ratio and efficiency- Expressions for VR in case of Simple, Differential and 3 systems of pulleys, Worms and Worm wheel, Rack and pinion, Winch crabs, Screw jack - Conditions for reversibility and self locking - Law of Simple Machine - Effort lost in friction - Load Equivalent of Friction - Max M A and Max efficiency – Simple problems

6) Basic Link Mechanism

Definition and explanation of link, kinematic pair, kinematic chain, Mechanism, structure and machine - Quadric cycle chain and its inversions - Slider Crank chain and its inversion

REFERENCE BOOKS:

1	Engineering Mechanics	by	Singer (B.S.Publications)
2	Engineering Mechanics	by	Basudeb Bhattacharya (Oxford Publishers)
3	Engineering Mechanics	by	A Nelson(McGraw Hill)
4	Engineering Mechanics	by	I.B.Prasad
5	Engineering Mechanics	by	R.S.Khurmi (S.Chand& Company)
6	Theory of Machines	by	S.S.Rathan (TMH)

WORKSHOP TECHNOLOGY

Subject Title : Workshop Technology
Subject Code : M - 106
Periods/Week : 04
Periods per Year : 120

Time Schedule

Sno	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay type Questions
1.	Basic Workshop tools & Operations				
	(a) Carpentry	16	13	1	1
	(b) Fitting	18	16	2	1
	(c) Forging	18	16	2	1
	(d) Tin Smithy	16	13	1	1
2.	Foundry	18	16	2	1
3.	Drilling	8	10	-	1
4.	Sawing	8	10	-	1
5.	Mechanical Working of Metals	18	16	2	1
	Total	**120**	**110**	**10**	**08**

OBJECTIVES

On completion of the study of the subject a student will be able to comprehend the following

1) Basic Workshop tools & Operations

a) **Carpentry**
- i) Identify various carpentry tools
- ii) Illustrate various carpentry tools
- iii) State the specifications and applications of a given tool
- iv) Describebasic wood working processes
- v) State the practical applications of carpentry joints
- vi) Explain the working principle of wood working lathe,wood planer, belt sander, spindle sander,disc sander, and grinder

b) **Fitting**
- i) Identify various fitting tools
- ii) Illustrate various fitting tools
- iii) State the specifications and applications of a given tool
- iv) Describe the working of common precision measuring instruments with a sketch
- v) Describebasic fitting operations

c) **Forging**
- i) Identify various tools used in black-smithy
- ii) State the specifications and applications of a given tool
- iii) List out the equipment of a forge shop
- iv) Describe the important smithy operations
- v) Explain the principles of machine forging
- vi) Explain basic machine forging operations
- vii) Describe a forging press

d) **Sheet Metal**

i) Identify various tools used in sheet metal work
ii) State the specifications and applications of a given tool
iii) Identify the stakes used in sheet metal work
iv) State the applications of a given stake
v) Identify various sheet metal joints
vi) State the practical applications of a given joint
vii) Describe the sheet metal operations with sketches
viii) Differentiate between riveting, soldering, & brazing

2) **Foundry**

a) Appreciate foundry as a manufacturing process
b) State the advantages of casting over other processes
c) State the limitations of casting process
d) List out the various hand moulding tools
e) State the properties of good moulding sand
f) List out the types of moulding sands
g) List out the ingredients of foundry sand
h) List out the various types of patterns
i) Explain the various pattern allowances
j) Identify the colour codes used in foundry
k) Explain the various moulding methods
l) State the need of cores
m) List out the types of cores
n) Identify the casting defects their causes and possible remedies
o) State the principle and applications of Die casting,Centrifugal casting, CO_2 process, investment casting

3) Drilling

a) State the principle of drill work
b) Classify drilling machines
c) Draw line diagrams of Sensitive & Radial drilling machinesand identify their parts
d) Describe the functions of each part of a drilling machine
e) State the specifications of a drilling machine
f) Illustratea twist drill
g) State the Nomenclature of a drill bit
h) List out the functions of the various elements of a twist drill
i) State the specifications of a twist drill
j) List out the different operations performed on a drilling machine

4) Sawing

a) Differentiate between hand sawing and machine sawing
b) Classify sawing machines
c) Illustrate saw tooth nomenclature
d) List out the materials used for saw blades
e) Illustrate Band saw & Reciprocating power hack saw
f) Describe the working of Band saw & Reciprocating power hack saw

5) Mechanical working of Metals

a) Define mechanical working of metals
b) Differentiate between cold working and hot working
c) Illustrate hot rolling, piercing, spinning, extrusion and drawing
d) State advantages and limitations of hot working
e) State the effects of Hot working on the properties of the material
f) Illustrate cold rolling, bending and squeezing operations
g) State advantages and limitations of cold working
h) State the effects of Cold working on the properties of the material

COURSE CONTENTS

1) Basic Workshop tools & Operations

a) **Carpentry**

i) **Marking & measuring tools:** Scales- rules- fourfold wooden rule- measuring tape- straight edge- try square- bevel square- combination square- marking knife- marking gauge- mortise gauge- cutting gauge- wing compass – trammel – divider- outside calliper- inside calliper- spirit level- plum bob

ii) **Saws**: Ripsaw - cross cut saw - Panel saw - Tenon saw - Dovetail saw - Bow saw - coping saw - compass saw - keyhole saw

iii) **Chisels**: Firmer chisel - Bevelled edge firmer chisel - Parting chisel - Mortise chisel - inside and outside gouges

iv) **Planes:** Jack plane - rough plane - smoothing plane - rebate plane - plough plane - router - spoke shave - metal jack plane - special planes

v) **Boring Tools**: Gimlet - wheel brace -ratchet brace - shell bit -auger - expansive bit - centre bit -countersink bit - drill - reamer

vi) **Striking tools**: Hammers -Warrington hammer -claw hammer –mallet

vii) **Holding tools :** Bench vice - bench stop - bench hold fast - sash cramp – G cramp -hand screw

viii) **Miscellaneous tools:** Rasps and files - scraper - oilstone - glass paper - pincer - screw driver - cabinet screw driver - ratchetscrew driver - saw set

ix) **Wood working Processes:** Marking - sawing - planning - chiselling - boring - Grooving - Rebating

x) **Carpentry joints:** Halving joint -mortise and tenon joint -bridle joint -butt joint - dowel joint - tongue & groove joint - screw & slot joint - dovetail joint - corner joint

xi) **Wood working machines:** Wood working lathe - wood planer-belt sander- spindle sander - disc sander- grinder

b) **Fitting**

i) **Chisels:**Flat chisel - cross cut chisel - half round chisel - diamond point chisel - side chisel

ii) **Files: F**lat file - hand file - square file - pillar file - round file -triangular file - half round file - knife edge file - needle file

iii) **Scrapers:**Flat - triangular - half round

iv) **Saws:** Hacksaw - solid frame& adjustable frame -blades

v) **Drill bits:**Flat drill - straight fluted drill - twist drill - parallel shank& tapered shank types

vi) **Reamers:** Hand reamer - machine reamer - straight and spiral flute types

vii) **Taps & dies:** Hand taps - taper tap - plug tap - bottoming tap –solid dies & split dies

viii) **Hammers:** Ball peen - cross peen - straight peen - soft hammer

ix) **Holding tools:** Bench vice – legvice - hand vice - pin vice - tool maker's vice - pipe vice

x) **Marking tools**: Surface plate – vblock -angle plate - try square - scriber - prick punch - centre punch - number punch - letter punch

xi) **Miscellaneous tools**: Screw drivers - single ended & double endedspanners - box typespanners - adjustable spanners - cutting pliers - nose pliers -Allen keys

xii) **Checking and measuring instruments:** Outside &inside callipers - spring callipers - odd leg calliper - transfer calliper - dividers - combination square - universal bevel protractor - sine bar - universal surface gauge - engineer's parallels - slip gauges - feeler gauge - angle gauge - radius & template gauge - screw pitch gauge - telescopic gauges - plate & wire gauge - ring and plug gauges - snap gauges - vernier callipers - vernier height gauge - vernier depth gauge - outside & inside micrometer - stick micrometer - depth micrometer - vernier micrometer - screw thread micrometer

xiii) **Fitting operations:** Chipping - filing - scrapping - grinding - sawing - marking - drilling - reaming - tapping and dieing

c) **Forging**

i) **Hand tools:** Anvil - swage block - hand hammers - sledge hammers - tongs – chisels - swages - fullers - flatters - set hammer - punch and drift

ii) **Equipment:** Open and closed hearth furnaces - hand and power blowers - open and stock fire

iii) **Fuels:**charcoal - coal - oil &gaseous fuels

iv) **Smith Operations:** Upsetting - drawing down - setting down - punching and drifting - bending - welding - cutting - swaging -Fullering and flattering

v) **Machine Forging:** Need of machine forging - forging hammers - spring hammers - pneumatic hammers - steam hammers - drop hammers - Hydraulic press

vi) **Machine forging operations:** - Drawing - upsetting & punching

vii) Tools used in machine forging

d) **Sheet Metal Work (Tin smithy):**

i) **Tools : S**teel rule - circumference rule - thickness gauge - sheet metal gauge - straight edge - scriber - divider -trammel points - punches - chisels – hammers - straight snip - double cutting shear - squaring shear - circular shear bench & block shears - pliers (Flat nose and round nose) - grocers and rivet sets - soldering iron

ii) **Stakes:** Double seaming stake - beak horn stake - bevel edged square stake -hatches stake - needle stake -blow horn stake -hollow mandrel stake

iii) **Sheet Metal Operations**: ***Shearing***: Cutting off – parting – blanking - punching - piercing - notching - slitting - lancing - nibbling and trimming ***Bending***: Single bend - double bend - straight flange - edge hem - embossing - beading - double hem or lock seam ***Drawing:*** Deep drawing - shallow or box drawing***Squeezing:*** Sizing - coining - hobbing - ironing - riveting

iv) **Sheet Metal Joints**: Single hem - double hem & wired edge seam joint - lap seam - grooved seam - single seam - double seam - dovetail seam - burred bottom seam or flanged seam

v) **Fastening Methods**: Riveting - soldering - brazing & spot welding

2) **Foundry:** Development of foundry as a manufacturing process - advantages and limitations of casting over other manufacturing processes

a) **Hand moulding tools** : Shovel - riddle - rammers - trowels - slicks - lifter - strike - off bar – spruepin - bellow - swab - gate cutter - mallet - vent rod - draw spike - rapping plate - pouring weight - gagger - clamps - spirit level - moulding boxes - snap box & flash box

b) **Sands :**Properties of moulding sand - porosity - flow ability - collapsibility - adhesiveness - cohesiveness - refractoriness - types of moulding sand - Green sand - dry sand - loam sand - facing sand - backing sand - parting sand - core sand - system sand

c) **Pattern making:** Materials such as wood -cast Iron - Aluminium - Brass – Plastics - classification of patterns such as solid (one piece) - two piece and three pieces - split patterns - gate patterns and shell patterns - sequence in pattern making - pattern allowances and colour codes

d) **Moulding methods**: green sand and dry sand moulding -cement bonded moulding - shell moulding - Ceramic moulding

e) **Cores**: Need of cores - types of cores

f) **Defects in castings**: Causes and their remedies

g) **Special casting processes:** Die Casting - Centrifugal casting - CO_2 process - investment casting

3) **Drilling:**

a) **Drilling machines:**Sensitive & Radial drilling machines - their constructional detail and specifications

b) **Drill bits:** Terminology - Geometry of twist drill -functions of drill elements

c) **Operations**: Drilling - reaming - boring - counter boring - counter sinking - tapping - spot facing - gang drilling

4) **Sawing:** Hand sawing - Power sawing principles

a) **Metal sawing machines**: Reciprocating saws (vertical and horizontal) saws- Band saws- constructional details and specifications of the above

b) **Metal Saw blades:** Types - Angles of saw teeth set - Saw material

5) **Mechanical working of metals:** Introduction to Hot working and cold working
   a) **Hot working processes:** rolling - types of rolling - two high mills - three high mills - four high mills - Piercing or seamless tubing - drawing or cupping – spinning- extrusion - direct or forward extrusion - indirect or backward extrusion - tube extrusion - impact extrusion Effects of hot working on metals - advantages & limitations of hot working of metals
   b) **Cold working processes**: Rolling – drawing - wire drawing - tube drawing –bending - roll forming - angle bending - spinning - extrusion -squeezing - cold heading - thread rolling – peeningEffects of Cold working on metals - advantages & limitations of cold working

REFERENCE BOOKS

1.	Production Technology	by	Jain & Gupta
2.	Elementary Workshop Technology	by	HazraChowdary& Bhattacharya
3.	Workshop Technology Vol I & II	by	Raghuvamshi
4.	Workshop Technology	by	Pakirappa.
5.	Workshop Technology	by	N.Krishna Murthy.

ENGINEERING DRAWING

Subject Title : Engineering Drawing
Subject Code : 107 (Common to all Branches)
Periods/Week : 06
Periods Per Year : 180

Time Schedule

Sno	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	01	-	-	-
2	Engineering Drawing Instruments	05	-	-	-
3	Free hand lettering & Numbering	06	5	1	-
4	Dimensioning Practice	09	5	1	-
5	Geometrical Constructions	21	15	1	1
6	Projection of points, Lines, Planes & Solids	21	10	-	1
7	Auxiliary views	06	5	1	-
8	Sectional views	27	10	-	1
9	Orthographic Projection	33	10	-	1
10	Pictorial drawing	30	10	-	1
11	Development of surfaces	21	10	-	1
	Total	**180**	**80**	**04**	**06**

The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

OBJECTIVES

Upon completion of the subject the student shall be able to

1) Understand the basic concepts of Engineering Drawing
   a) State the importance of drawing as an engineering communication medium
   b) State the necessity of B.I.S. Code of practice for Engineering Drawing
   c) Explain the linkages between Engineering drawing and other subjects of study in diploma course

2) Use of Engineering Drawing Instruments
   a) Select the correct instruments and draw lines of different orientation
   b) Select the correct instruments and draw small and large Circles
   c) Select the correct instruments for measuring distances on the drawing
   d) Use correct grade of pencil for different types of lines, thickness and given function
   e) Select and use appropriate scales for a given application
   f) Identify different drawing sheet sizes as per I.S. and Standard Layouts
   g) Prepare Title block as per B.I.S. Specifications
   h) Identify the steps to be taken to keep the drawing clean and tidy

3) Write Free Hand Lettering and Numbers

a) Write titles using slanting letters and numerals of 7mm, 10mm and 14mm height
b) Write titles using vertical letters and numerals of 7mm, 10mm and 14mm height
c) Select suitable sizes of lettering for different layouts and applications

4) Understand Dimensioning Practice

a) Define “Dimensioning”
b) State the need of dimensioning the drawing according to accepted standards
c) Identify notations of Dimensioning used in dimensioned drawing
d) Identify the system of placement of dimensions in the given dimensioned drawing
e) Dimension a given drawing using standard notations and desired system of dimensioning
f) Dimension standard features applying necessary rules
g) Arrange dimensions in a desired method for a given drawing
h) Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly

5) Apply Principles of Geometric Constructions

a) Divide a given line into desired number of equal parts internally
b) Draw tangent lines and arcs
c) Use General method to construct any polygon
d) Explain the importance of conics
e) Construct ellipse by concentric circles method
f) Construct parabola by rectangle method
g) Construct rectangular hyperbola from the given data
h) Construct involute from the given data
i) Construct cycloid and helix from the given data
j) State the applications of the above constructions in engineering practice

6) Apply Principles of Projection of points, lines, planes & solids

a) Visualize the objects
b) Explain the I-angle and III-angle projections
c) Practice the I-angle projections
d) Draw the projection of a point with respect to reference planes (HP&VP)
e) Draw the projections of straight lines with respect to two reference planes (cases of lines parallel to one plane and inclined to other plane only)
f) Draw the projections of planes (cases of planes perpendicular to one plane and inclined to other plane only)
g) Draw the projections of solids (cases of axis perpendicular to one plane and inclined to other plane only)

7) Understand the need of auxiliary views

a) State the need of Auxiliary views for a given engineering drawing
b) Draw the auxiliary views of a given engineering component
c) Differentiate between auxiliary view and apparent view

8) Appreciate the need of Sectional Views

a) Explain the need to draw sectional views
b) Select the section plane for a given component to reveal maximum information
c) Explain the positions of section plane with respect to reference planes
d) Differentiate between true shape and apparent shape of section
e) Draw sectional views and true sections of regular solids discussed in chapter-6 above
f) Apply principles of hatching

9) Apply principles of orthographic projection

a) Explain the principles of orthographic projection with simple sketches
b) Draw the orthographic view of an object from its pictorial drawing

c) Draw the minimum number of views needed to represent a given object fully

10) Prepare pictorial drawings

a) State the need of pictorial drawings
b) Differentiate between isometric scale and true scale
c) Prepare Isometric views for the given orthographic drawings

11) Interpret Development of surfaces of different solids

a) State the need for preparing development drawing
b) Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramids) using parallel line and radial line methods
c) Prepare development of surface of engineering components like trays, funnels, 90^0 elbows & rectangular ducts

COURSE CONTENT

NOTE

1) B.I.S Specifications should invariably be followed in all the topics.
2) A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.
3) First Angle Projection is to be followed for all Orthographic projection exercises

1) The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing, Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46–1988 – Mention B.I.S - Role of drawing in engineering education – Link between Engineering drawing and other subjects of study

2) Engineering drawing Instruments

Classification: Basic tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mention the names under each classification and their brief description -Scales: Recommended scales reduced & enlarged scales- Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet

<u>Drawing Plate 1</u>: Consisting of two exercises on use of drawing instruments

3) Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering- Practicing letters & numbers of given sizes (7mm, 10mm and 14mm) Advantages of single stroke or simple style of lettering

<u>Drawing plate 2</u>: Consisting of five to six exercises on freehand Lettering & Numbering

4) Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object - Dimensioning size, Location features, surface finish, fully dimensioned Drawing - Notations or tools of dimensioning, dimension line, extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools - Placing dimensions: Aligned system and unidirectional system (SP-46- 1988) - Arrangement of dimensions: Chain, parallel, combined, progressive, and dimensioning by co-ordinate methods - The rules for dimensioning standard features Circles (holes) arcs, angles, tapers, chamfers, and dimensioning of narrow spaces

Drawing Plate 3: Consisting of 8 exercises on Dimensioning methods and rules

5) **Geometric Constructions**

Division of a line: to divide a straight line into given number of equal parts internally and it's examples in engineering applications. Construction of tangent lines: to draw tangent lines touching circles internally and externally. Construction of tangent arcs i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles) ii) Tangent arc of given radius touching a circle or an arc and a given line iii) Tangent arcs of radius R, touching two given circles internally and externally Construction of polygon: Construction of any regular polygon of given side using general method. Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and loci of a moving point, Eccentricity of above curves – Their Engg. applications viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process - Construction of ellipse by concentric circles method - Construction of parabola by rectangle method - Construction of rectangular hyperbola - General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering applications, viz, Gear tooth profile, screw threads, springs etc. - their construction.

Drawing Plate 4: Consisting of eight exercises on construction of polygons
Drawing Plate 5: Consisting of eight exercises on construction of conics
Drawing Plate 6: Consisting of eight exercises on involute, cycloid and helix

6) **Projection of points, lines, planes & solids**

Projecting a point on two planes of projection -Projecting a point on three planes of projection - Projection of straight line i) Parallel to both the planes ii) Perpendicular to one of the planes iii) Inclined to one plane and parallel to other plane - Projection of regular planes- i) Plane perpendicular to HP and parallel to VP and vice versa ii) Plane perpendicular to HP and inclined to VP and vice versa - Projection of regular solids with i) Axis perpendicular to one of the planes ii) Axis parallel to VP and inclined to HP and vice versa

Drawing Plate 7: Consisting of eight exercises on projection of points and Lines
Drawing Plate 8: Consisting of eight exercises on projection of planes
Drawing Plate 9: Consisting of eight exercises on projection of solids

7) **Auxiliary views**

Need for drawing auxiliary views - Explanation of the basic principles of drawing auxiliary views, explanation of reference plane and auxiliary plane - Partial auxiliary view.

Drawing plate 10: Consisting of four exercises on auxiliary views

8) **Sectional views**

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

Drawing Plate 11: Consisting of six exercises on sections of solids

9) Orthographic Projections

Meaning of orthographic projection -Using a viewing box model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object - Concept of front view, top view, and side view, sketching these views for number of engineering objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of mitre line in drawing a third view when other two views are given - Method of representing hidden lines - Selection of minimum number of views to describe an object fully

Drawing Plate 12: Consisting of 12 exercises on orthographic projections of engineering objects

10) Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale-difference between Isometric view and Isometric projection - Isometric and Non-isometric lines - Isometric drawing of common features like rectangles, circular shapes, non-isometric lines - Use of box and offset methods

Drawing plate 13: Consisting of 12 exercises on Isometric views of engineering objects

11) Development of Surfaces

Need for preparing development of surface with reference to sheet metal work -Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal plane and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramids -Types of development: Parallel line and radial line development -Procedure of drawing development - drawings of trays, funnels, 90^0 elbow pipes and rectangular ducts.

Drawing plate 14: Consisting of 5 exercises on development problems

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)
Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)
Engineering Drawing by N.D.Bhatt.
T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.
SP-46-1998 – Bureau of Indian Standards.

BASIC WORKSHOP PRACTICE

Subject Title : Basic Workshop Practice
Subject Code : M -108
Periods/Week : 06
Periods per Year : 180

Time Schedule

S.No	Major Title	No of Periods
1.	Fitting shop	36
2.	Forging shop	39
3.	Carpentry shop	51
4.	Sheet metal work	51
	Test	03
	Total	**180**

OBJECTIVES

Upon completion of the course the student shall be able to

1) Practice the required operations in Fitting Shop
2) Practice the required operations in Forging Shop
3) Practice the required operations in Carpentry Shop
4) Practice the required operations in Sheet metal Shop

COURSE CONTENT

1) FITTING SHOP

a) Marking and chipping on Mild – steel flat 6 mm thick
b) Cutting with hack saw M.S. Flats of 6 mm thick
c) Marking, cutting, drilling, Chamfering and tapping on a M.S. Flat 6 mm thick.
d) Assembling of two pieces
e) Matching by filing (6 mm thick M.S. Plate)

2) FORGING SHOP

a) Conversion of round to square
b) Conversion of round to Hexagon
c) Preparation of chisel from round rod
d) Preparation of ring and hook from M.S. round
e) Preparation of a hexagonal bolt and nut

3) CARPENTRY SHOP

a) Cutting of wood with hand saw
b) Planning of wood
c) Planning and chiselling of wood, orientation of wood grain
d) Preparation of dovetail joint
e) Mortise and tenon joint
f) Wood turning on a lathe
g) Preparation of one household article

4) SHEET METAL WORK

a) Cutting Practice on cutting of sheet
b) Formation of joints like grooved joints, locked groove joint
c) Preparation of a rectangular open type tray
d) Preparation of hollow cylinder
e) Preparation of pipe elbow
f) Preparation of mug
g) Preparation of funnel
h) Preparation of utility articles such as dustpan, kerosene hand pump.

REFERENCE BOOKS

1. Manufacturing Technology (Vol I) by P N Rao (McGraw Hill)
2. Principles of Foundry Technology by P L Jain (McGraw Hill)

PHYSICS LABORATORY

Subject Title : Physics Laboratoy
Subject Code : Common -109
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practise with Vernier calipers to determine the volumes and areas of a cylinder and sphere and their comparison etc .

2.0 Practise with Screw gauge to determine thickness of a glass plate, cross sectional area of a wire and volumes of sphere and also their comparison etc

3.0 Verify the parallelogram law and Triangle law

4.0 Determine the value of acceleration due to gravity using Simple Pendulum

5.0 Determine the velocity of sound in air at room temperature and its value at zero degree centigrade

6.0 Calculate the Focal length and focal power of convex lenses using distant object method , U-V method , U-V graph and 1 / U – 1 / V graph methods and their comparison,

7.0 Determine the refractive index of a solid using travelling microscope

8.0 Determine the surface tension of a liquid using travelling microscope

9.0 Determine the viscosity of a liquid using capillary method

10.0 Verify the Boyle's law employing a Quill tube

11.0 Determine the specific resistance of material of a wirel using Meter Bridge

12.0 Drawing magnetic lines of force under N-S and N-N methods and locate null points

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
1. Hands on practice on Vernier Calipers(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the physical quantities of given object	• Read the scales • Calculate the requisite physical quantities of given objects
2. Hands on practice on Screw gauge(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire and other quantities	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire and other quantities
3. Verification of Parallelogram law of forces and Triangle law of forces(03)	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum(03)	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph

Name of the Experiment(Periods)	Competencies	Key competencies
5. Velocity of sound in air –Resonance method (03)	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound at room temperature • Calculate velocity of sound at 0^0 C
6. Focal length and Focal power of convex lens (Separate & Combination) (03)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v graphs	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graphs
7. Refractive index of solid using traveling microscope(03)	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope(03)	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water

Name of the Experiment	Competencies	Key competencies
9. Coefficient of viscosity by capillary method(03)	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water
10. Boyle's law verification (03)	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
11. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force(03)	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

CHEMISTRY LABORATORY

Subject Title : Chemistry Laboratory
Subject Code : Common -110
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making solutions of different dilution solution.	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. $KMnO_4$	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA solution	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength required level	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.

2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.

3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl

4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0 Conduct titrations adopting standard procedures and using Std. $KMnO_4$ solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions

a) To determine conductivity

b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Familiarization of methods for Volumetric analysis (03)	--	--
Preparation of Std Na_2CO_3 and making solutions of different dilution (03)	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions
Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Estimation of HCl solution using Std. Na_2CO_3 solution (03)	▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
Estimation of NaOH using Std. HCl solution (03)		
Estimation of H_2SO_4 using Std. NaOH solution (03)		

Estimation of Mohr's Salt using Std. $KMnO_4$ (03)	▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	
Determination of acidity of water sample (03)		
Determination of alkalinity of water sample (03)		
Determination of total hardness of water using Std. EDTA solution (03)		
Estimation of Chlorides present in water sample (03)		
Estimation of Dissolved Oxygen (D.O) in water sample (By titration method) (03)		
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method) (03)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Determination of pH using pH meter (03)		
Determination of conductivity of water and adjusting ionic strength to required level (03)		
Determination of turbidity of water (03)		
Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Estimation of total solids present in water sample (03)	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

(Common to all Branches)

Computer Fundamentals Laboratory

Subject Title : Computer Fundamentals Laboratory

Subject Code : M-111
Periods/Week : 03
Periods/Year : 90

Time Schedule

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	02	06
II.	Windows Operating System	02	06
III.	MS Word	08	24
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
	Total	30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to wide spread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a) To familiarize with a Computer System and its hardware connections.
   b) To start and Shutdown a Computer correctly.
   c) To check the software details of the computer
   d) To practice Internal and External DOS commands
2. To check the hardware present in your computer.

II. Windows's operating system (Not for end examination)

3. To explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics
8. To practice Formatting techniques

9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Keyboard	a. Login and logout as per the standard procedure b. Operate mouse & Keyboard
1 (c).	To explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager

1(d).	To practice Internal and External DOS commands	a. Practice Internal commands b. Practice External commands	Familiarize with MS-DOS Commands
2.	To check the software details of the computer	c. Find the details of Operating System being used d. Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard Disk Drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste or move commands to organize files and folders	a. Create files and folders rename , arrange and search for the required folder/file

Exp No.	Name of the Experiment	Competencies	Key Competencies
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut for files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS Paint to create /Edit pictures and save in the required format.

6.	To familiarize with Ribbon layout of MS Word. – Home – Insert- Page Layout- References- Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use keyboard and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers

Exp No.	Name of the Experiment	Competencies	Key Competencies
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar- Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move around a Worksheet-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit

Exp No.	Name of the Experiment	Competencies	Key Competencies
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce an Excel Column Chart c. Practice creating any Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
21.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in Home, insert, design, animation , slideshow, Review &View in the PowerPoint	Access required options in the tool bar

Exp No.	Name of the Experiment	Competencies	Key Competencies
22.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation	a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and WordArt f. Use 3d features g. Arrange objects	Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
26.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
27.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.

Exp No.	Name of the Experiment	Competencies	Key Competencies
28.	To Insert audio &video, Hyperlinks in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like *Entrance, Emphasis, Motion Paths &Exit*	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

III SEMESTER

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16
III Semester

Sub code	C16-Subjects	No of Periods per week		Total periods per semester	Scheme of Examination			
		Theory	Practice		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-301	Engineering Mathematics-II	5		75	3	20	80	100
M-302	Strength of Materials	6		90	3	20	80	100
M-303	Thermal Engineering-I	6		90	3	20	80	100
M-304	Production Technology-I	5		75	3	20	80	100
M-305	Basic Electrical Engineering & Electronics	5		75	3	20	80	100
PRACTICAL								
M-306	Machine Drawing		6	90	3	40	60	100
M-307	Fuels lab and Electrical Engineering Lab		3	45	3	20+20	30+30	100
M-308	Materials testing lab		3	45	3	40	60	100
M-309	Workshop Practice-II		3	45	3	40	60	100
	T O T A L	**27**	**15**	**630**		**260**	**640**	**900**

Engineering Mathematics-II

Subject Title : Engineering Mathematics-II
Subject Code : A-301
Periods per week : 05
Periods per Semester : 75

Blue print

Upon completion of the subject the student shall be able to

S. No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
	Unit - I			R	U	App	R	U	App
1	**Indefinite Integration**	15	21	1	1	0	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Unit - II								
2	**Definite Integration and its applications**	35	60	1	1	3	1	1	$2\frac{1}{2}$
	Unit - III								
3	**Differential Equations**	25	29	2	1	0	1	1	0
	Total	**75**	**110**	**4**	**3**	**3**	**$2\frac{1}{2}$**	**$2\frac{1}{2}$**	**3**
			Marks:	12	9	9	25	25	30

R: Remembering type 37 marks
U: Understanding type 34 marks
App: Application type 39 marks

OBJECTIVES

Unit-I

1.0 Indefinite Integration

1.1 Explain the concept of Indefinite integral as an anti-derivative.

1.2 State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\,dx$ and $\int ku\,dx$ where k is constant and u, v are functions of x.

1.3 Solve integration problems involving standard functions using the above rules.

1.4 Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\,dx$ *where* $f(x)\,dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\,dx$

iii) $\int f'(x)/[f(x)]\,dx$

iv) $\int f\{g(x)\}\,g'(x)\,dx$

1.5 Find the Integrals of *tan x, cot x, sec x* and *cosec x* using the above.

1.6 Evaluate the integrals of the form $\int Sin^m\theta\ Cos^n\theta.\ d\theta$ where m and n are positive integers.

1.7 Evaluate integrals of powers of *tan x* and *sec x*.

1.8 Evaluate the Standard Integrals of the functions of the type

$$i)\ \frac{1}{a^2+x^2},\ \frac{1}{a^2-x^2},\ \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}},\ \frac{1}{\sqrt{a^2-x^2}},\ \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2},\ \sqrt{x^2+a^2},\ \sqrt{a^2-x^2}$$

1.9 Evaluate the integrals of the type

$$\int \frac{1}{a\pm bSin\theta}d\theta, \int \frac{1}{a\pm b\cos\theta}d\theta \text{ and } \int \frac{1}{a\cos\theta\pm b\sin\theta\pm c}d\theta\ .$$

1.10 Evaluate integrals using decomposition method.

1.11 Evaluate integrals using integration by parts with examples.

1.12 State the Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.

1.13 Evaluate the integrals of the form $\int e^x[f(x)+f'(x)]\,dx$.

Unit-II

(a) Understand definite integral and its properties

2.1 State the fundamental theorem of integral calculus

2.2 Explain the concept of definite integral.

2.3 Calculate the definite integral over an interval.

2.4 State various properties of definite integrals.

2.5 Evaluate simple problems on definite integrals using the above properties.

(b) Real life applications of definite integrals

2.6 Explain definite integral as a limit of sum by considering an area.

2.7 Find the areas under plane curves and area enclosed between two curves using integration.

2.8 Obtain the volumes of solids of revolution.

2.9 Obtain the mean value and root mean square value of the functions in any given interval.

2.10 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and provide some examples.

(c) Certain special integrals: Laplace Transforms

2.11 Write the definition of Laplace Transform and explain sufficient conditions for its existence.

2.12 Provide formulae for Laplace transforms of standard functions.

2.13 State Linear property, First shifting property, Change of Scale property for Laplace transforms. Solve simple problems using these properties.

2.14 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^{(n)}(t)$, $\int_0^t f(u)\,du$ in terms of Laplace transform of $f(t)$. Provide simple examples on these functions.

2.15 Define unit step function and write the Laplace Transform of unit step function.

State second shifting property.

2.16 Define inverse Laplace Transform and write inverse Laplace Transform of standard functions. Solve simple problems.

2.17 Write first shifting property of inverse Laplace Transform with examples

2.18 Define convolution of two functions and state convolution theorem with few examples for understanding only.

(d) Understand the Fourier series expansion of functions

2.19 Define Fourier series of a function on the interval $(c, c+2l)$ and state sufficient conditions for its existence. Write the Euler's formulae for determining the Fourier coefficients.

2.20 Find Fourier series of simple functions in the range $(0,2l), (0,2\pi), (-l,l)\ and\ (-\pi,\pi)$.

2.21 Find Fourier coefficients for even and odd functions in the interval $(-l,l)\ and\ (-\pi,\pi)$ in simple examples.

2.22 Define half range Fourier sine and cosine series of a function over the interval $(0,\ l)$ with examples.

3.0 Introduction to Differential Equations

3.1 Define a Differential equation, its order, degree

3.2 Form a differential equation by eliminating arbitrary constants.

3.3 Solve the first order first degree differential equations by the following methods:

i. Variables Separable.
ii. Homogeneous Equations.
iii. Exact Differential Equations
iv. Linear differential equation of the form dy/dx + Py = Q, where P and Q are functions of x or constants.
iv. Bernoulli's Equation (Reducible to linear form.)

3.4 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, Complex conjugates.

3.5 Solve the higher order homogeneous differential equations with constant coefficients.

3.6 Explain the concept of complementary function, particular Integral and general solution of a differential equation.

3.7 Solve n^{th} order differential equation of the type *f(D) y = X* where *f(D)* is a polynomial of nth order and *X* is a function of the form *k,* e^{ax} *, Sinax, Cosax,* x^n.

3.8 Solve simple problems leading to engineering applications

COURSE CONTENT

Unit-I

Indefinite Integration:

1**.** Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of indefinite integral. Integration by substitution or change of variable. Integrals of the form $\sin^m\theta.\ \cos^n\theta$. where m and n are positive integers. Integrals of tan x, cot x, sec x, cosec x and powers of tan x, sec x by substitution.

Evaluation of integrals which are reducible to the following forms :

$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$

$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$

$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$

Integration by decomposition of the integrand into simple rational, algebraic functions. Integration by parts, Bernoulli's rule.

Unit-II

Definite Integral and its applications:

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Volumes of solids of revolution. Mean and RMS values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

. Definition, sufficient conditions for existence of Laplace Transform (LT), LT of elementary functions, linearity property, scale change property, first shifting property, multiplication by t^n, division by t, LT of derivatives and integrals, unit step function, LT of unit step function, second shifting theorem, inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s – examples of inverse LT using partial fractions – convolution theorem (no proof).

Representation of a function in Fourier series over the interval $(c, c+2l)$, Give sufficient conditions for existence of Fourier series. Euler's formulae for Fourier coefficients, Finding Fourier coefficients for simple functions, elementary even and odd functions. Define half range Fourier series.

Unit -III

Differential Equations:

Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of first order, first degree: variable-separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X, where X is in the form k, e^{ax}, sin ax, cos ax, x^n, (n= 1,2) – complimentary function, particular integral and general solution.

Reference Books:

1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. A Text book of Engg. Mathematics by B.S.Grawel
4. A Text book of Engg. Mathematics by B.V.Ramana- T.Mc Graw Hill Publishers

STRENGTH OF MATERIALS

Subject Title : Strength of Materials
Subject Code : M-302
Periods/Week : 06
Periods per Semester : 90

TIME SCHEDULE

S No.	Major Topics	No. of Periods	Weightage of Marks	Short answer Questions	Essay type Questions	Unit Test bifur-cation
1	Simple Stresses and Strains	15	16	2	1	Unit Test - I
2	Strain energy	08	13	1	1	
3	Thin Cylindrical shells	08	13	1	1	
4	Shear Force and Bending moment Diagrams	15	13	1	1	
5	Theory of Simple bending	12	13	1	1	Unit Test - II
6	Deflection of Beams	07	13	1	1	
7	Torsion in Shafts	15	16	2	1	
8	Springs	10	13	1	1	
	Total	**90**	**110**	**10**	**8**	

OBJECTIVES

Up on completion of the course the student shall be able to

1 Simple Stresses and Strains

1.1. Define the strength, Mechanical properties of commonly used engineering materials.
1.2 Identify the nature and effect of tensile, compressive and shear forces.
1.3 Define the terms stress, strain
1.4 State Hook's law, define the terms Poisson's ratio and elastic modulii
1.5 Draw the typical stress - strain curve for ductile and brittle materials under tension indicating salient points on it.
1.6 Mention the significance of Factor of Safety.
1.7 Write down the relation between elastic constants E,N,K,& 1/m.
1.8 Compute stress and strain values in bodies of uniform section and of composite section under the influence of normal forces.
1.9 Calculate thermal stresses, in bodies of uniform section and composite sections.
1.10 Compute changes in axial, lateral and volumetric dimensions of bodies of uniform sections under the action of normal forces.

2 Strain Energy

2.1 Define resilience, proof – resilience and modulus of resilience.
2.2 Derive an expression for the strain energy.
2.3 Obtain expressions for instantaneous stress developed in bodies subjected to –
i) Gradually applied load.
ii) Suddenly applied load
iii) Impact/shock load.
2.4 Comparison of proof resilience in bodies subjected to the above loads.

3 Thin Cylindrical Shells

3.1 Definition of cylindrical shell

3.2 Definition of longitudinal and hoop stress
3.3 Derive the expression for longitudinal, hoop and shear stress for seamless and seam shells.
3.4 Longitudinal, hoop and volumetric strain and change in dimensions of a seamless shell subjected to internal fluid pressure
3.5 Design of thin cylindrical shells.

4 Shear Force and Bending Moment Diagrams

4.1 List the types of beams.
4.2 List the types of loading
4.3 Explain the terms shear force and bending moment.
4.4 Compute shear force and bending moment at any section of beam.
4.5 Draw the diagrams of S.F. & B.M for cantilever, simple supported and overhanging beams (for overhanging beams combination of point loads and udl not included)

5 Theory of Simple Bending

5.1 State the theory and terms of simple bending.
5.2 List the assumptions in theory of simple bending
5.3 Derive the bending equation $M / I = \sigma / y = E / R$
5.4 Calculate Bending stress, Modulus of section and Moment of resistance.
5.5 Calculate the safe load, safe span and dimensions of cross section.

6 Deflection of Beams

6.1 Define and explain the term deflection.
6.2 State the formulae for deflection in cantilever and simply supported beams under standard conditions
6.3 Calculate the values of deflection in the given beams.

7 Torsion in Shafts

7.1 Function of Shaft
7.2 Explain Polar M.I. of solid and hollow shaft
7.3 List the assumptions in theory of Simple Torsion
7.4 Derive the torque equation $T / J = f_s / R = G\theta / L$
7.5 Design of solid and hollow shafts and power transmitted
7.6 Comparison for strength and weight of solid and hollow shafts of the same length and material

8 Springs

8.1 Function of spring
8.2 Types and applications of springs
8.3 Define the terms related to closed coil helical spring
8.4 State the formulae for the stress and deflection of closed coil helical spring
8.5 Compute the stress and deflection of the closed coil helical spring
8.6 Define the terms related to semi-elliptic or leaf spring or laminated spring
8.7 State the formulae for the stress and deflection of leaf spring
8.8 Compute the stress and deflection of leaf spring

COURSE CONTENT

1 Simple Stresses and Strains

1.1 Types of forces.
1.2 Stress, Strain and their nature.
1.3 State Hook's law; know about Poisson's ratio, elastic modulii
1.4 Mechanical properties of common engineering materials.
1.5 Significance of various points on stress – strain diagram for M.S. and C.I. specimens
1.6 Significance of factor of safety

1.7 Relation between elastic constants.
1.8 Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces.
1.9 Thermal stresses in bodies of uniform section and composite sections.
1.10 Related numerical problems on the above topics

2 Strain Energy

2.1 Strain energy or resilience, proof resilience and modulus of resilience.
2.2 Derivation of strain energy for the following cases
- i) Gradually applied load.
- ii) Suddenly applied load
- iii) Impact/shock load.

2.3 Related numerical problems.

3 Thin Cylindrical Shells

3.1 Explanation of longitudinal and hoop stresses in the light of Circumferential and longitudinal failure of shell.
3.2 Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells.
3.3 State the expressions for change in dimensions and respective strains
3.4 Related numerical problems for safe thickness, safe working pressure, stresses, strains and change in dimensions of thin cylindrical shells

4 Shear Force & Bending Moment Diagrams

4.1 Types of beams with examples.
- a) Cantilever beam,
- b) Simply supported beam,
- c) Over hanging beam,
- d) Continuous beam,
- e) Fixed beam.

4.2 Types of Loads – Point load, UDL and UVL.
4.3 Definition and explanation of shear force and bending moment.
4.4 Calculation of shear force and bending moment and drawing the Diagrams by the analytical method only for the following cases.
- a) Cantilever with point loads.
- b) Cantilever with uniformly distributed load.
- c) Simply supported beam with point loads.
- d) Simply supported beam with uniformly distributed load.
- e) Combination of point and U.D.L. for the above and problems there upon.
- f) Over –hanging beam with point loads, at the centre and at free ends.
- g) Over – hanging beam with uniformly distributed load throughout.

5 Theory of Simple Bending Deflection of Beams

5.1 Explanation of terms
- a) Neutral layer
- b) Neutral Axis
- c) Modulus of Section
- d) Moment of Resistance
- e) Bending stress.
- f) Radius of curvature.

5.2 Assumptions in theory of simple bending.
5.3 Bending Equation $M / I = \sigma / Y = E / R$ with derivation.
5.4 Problems involving calculations of bending stress, modulus of section and moment of resistance.
5.5 Calculation of safe loads and safe span and dimensions of cross- section.

6 Deflection of Beams

6.1 Definition and explanation of deflection as applied to beams.

6.2 Deflection formulae without proof for cantilever and simply supported beams with point load and uniformly distributed load only (Standard cases only).

6.3 Related numerical problems.

7 Torsion in Shafts

7.1 Definition and function of shaft

7.2 Calculation of polar M.I. for solid and hollow shaft.

7.3 Assumptions in simple torsion

7.4 Derivation of formula $T / J = fs / R = G\theta / L$

7.5 Problems on design of shaft based on strength and rigidity

7.6 Numerical Problems related to comparison of strength and weight of solid and hollow shafts

8 Springs

8.1 Explanation about spring

8.2 Classification of springs

8.3 Nomenclature of closed coil helical spring

8.4 Deflection formula for closed coil helical spring (without derivation)

8.5 Explanation about stiffness of spring

8.6 Semi elliptical leaf spring deflection and stress formula (without derivation)

8.7 Numerical problems on closed coil helical spring and leaf spring to find safe load, deflection, size of coil and number of coils/plates.

REFERENCE BOOKS:

1. Strength of Materials by Sadhu Singh, Khanna Publishers
2. Strength of Materials by R.S. Khurmi , S Chand & Company
3. Strength of Materials by Ramamrutham, Dhanpatrai Publications

THERMAL ENGINEERING-I

Subject Title : Thermal Engineering-I
Subject Code : M-303
Periods/Week : 06
Periods per Semester : 90

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage of Marks	SAQ	EAQ	Unit Test bifur-cation
1	Perfect gas laws	08	13	1	1	Unit Test – I
2	Fundamentals of Thermodynamics	08	13	1	1	
3	Laws of Thermodynamics	12	13	1	1	
4	Thermodynamic Processes on gases	16	16	2	1	
5	Air standard cycles	10	13	1	1	Unit Test - II
6	Internal combustion engines	16	16	2	1	
7	Performance of IC engines	10	13	1	1	
8	Air Compressors	10	13	1	1	
	T O T A L	**90**	**110**	**10**	**8**	

OBJECTIVES

Upon completion of the course the student shall be able to:

1. Perfect gas laws

1.1. State Boyle's law, Charles law, Avogadro's law, Joule's law and express them mathematically
1.2. Write characteristic gas equation and universal gas equation, and state the SI units of the terms used
1.3. State the relation between characteristic and universal gas constants
1.4. Define specific heats at constant volume and at constant pressure for a perfect gas
1.5. State Regnault's law, and express it mathematically
1.6. State the relationship between the two specific heats of a gas and its characteristic gas constant with proper units
1.7. Solve simple problems applying gas laws and gas equations

2. Fundamentals of Thermodynamics

2.1. Define system, surroundings, universe, working fluid
2.2. Define the types of systems with practical examples
2.3. Define intrinsic and extrinsic properties of a system with practical examples
2.4. Define pressure, volume, temperature, density, enthalpy and internal energy of a system stating their SI units
2.5. Explain with illustration quasi-static work and flow work
2.6. Define thermodynamic State, Path, Process and Cycle with graphical representations

2.7. Differentiate between a reversible and irreversible processes
2.8. State the conditions for reversibility of a process and a cycle

3. Laws of Thermodynamics

3.1. State zeroth law of thermodynamics
3.2. State the significance of zeroth law
3.3. Differentiate between heat, temperature and thermal equilibrium
3.4. Differentiate between heat and work forms of energy
3.5. State first law of thermodynamics for a process and for cycle
3.6. State the significance of first law
3.7. Define Joule's constant
3.8. Apply first law to solve simple problems on heat and work conversions in thermodynamic processes and cycles
3.9. Write non flow energy equation (NFEE) and state the units of the terms involved
3.10. Apply NFEE to solve simple problems on closed systems
3.11. Write steady flow energy equation (SFEE) and state the units of the terms involved
3.12. Apply SFEE to solve simple problems on open systems
3.13. State the limitations of first law of thermodynamics
3.14. State the Clausius and Kelvin-Planck statements of second law of thermodynamics
3.15. State the significance of second law
3.16. Illustrate heat engine, refrigerator and heat pump
3.17. Define thermal efficiency of a heat engine
3.18. Solve simple problems on the concept of heat engine and heat pump
3.19. Define availability and unavailability
3.20. Define change in entropy of a system, and explain its significance
3.21. Write the expression for change in entropy of a system and state its SI units

4. Thermodynamic processes on gases

4.1. List out the popular thermodynamic processes on gases
4.2. Write the expressions for mathematical representation, change in enthalpy, change in internal energy, work transfer, heat transfer, and change in entropy for Isochoric process
4.3. Solve simple problems on Isochoric process
4.4. Write the expressions for mathematical representation, change in enthalpy, change in internal energy, work transfer, heat transfer, and change in entropy for Isobaric process
4.5. Solve simple problems on Isobaric process
4.6. Write the expressions for mathematical representation, change in enthalpy, change in internal energy, work transfer, heat transfer, and change in entropy for Hyperbolic process
4.7. Define Isothermal process
4.8. Show that for a perfect gas, Hyperbolic process is nothing but Isothermal process
4.9. Solve simple problems on Hyperbolic/Isothermal process
4.10. Write the expressions for mathematical representation, change in enthalpy, change in internal energy, work transfer, heat transfer, and change in entropy for adiabatic process
4.11. Differentiate between adiabatic and isentropic processes
4.12. Explain that a frictionless adiabatic process is nothing but an isentropic process
4.13. Solve simple problems on frictionless adiabatic/isentropic process
4.14. Write the expressions for mathematical representation, change in enthalpy, change in internal energy, work transfer, heat transfer, and change in entropy for Polytropic process
4.15. Solve simple problems on Polytropic process
4.16. Differentiate between isenthalpic and throttling processes
4.17. Show that for a perfect gas isenthalpic and throttling processes are the same
4.18. Show that Polytropic process is a general representation of all thermodynamic processes
4.19. Represent all the above processes on p-V and T-s graphs

5. Air standard cycles

5.1. Define air standard cycle
5.2. List out successful air standard cycles and their practical applications
5.3. Represent Carnot cycle on p-V and T-s diagrams
5.4. State the assumptions made in the development of Carnot cycle
5.5. Write the expression for thermal efficiency of a Carnot cycle
5.6. Solve simple problems on analysis of Carnot cycle
5.7. Explain why Carnot cycle is practically impossible
5.8. Represent Otto cycle on p-V and T-s diagrams
5.9. State the assumptions made in the development of Otto cycle
5.10. Write the expression for thermal efficiency of an Otto cycle
5.11. Solve simple problems on analysis of Otto cycle
5.12. Represent Diesel cycle on p-V and T-s diagrams
5.13. State the assumptions made in the development of Diesel cycle
5.14. Write the expression for thermal efficiency of a Diesel cycle
5.15. Solve simple problems on analysis of Diesel cycle
5.16. Explain why Carnot cycle is the most efficient of all cycles working between the same temperature limits

6. Internal Combustion Engines

6.1. Classify Heat engines with practical examples
6.2. Differentiate between external and internal combustion engines
6.3. Differentiate between rotary and reciprocating engines
6.4. Illustrate the principal parts of IC engines
6.5. State the materials used for the principal parts
6.6. Define calorific value of a fuel
6.7. Differentiate between the HCV and LCV of a fuel
6.8. Name the commercially available fuels for IC engines along with their HCV
6.9. Illustrate the working of a four stroke diesel engine
6.10. Illustrate the working of a four stroke petrol engine
6.11. Illustrate the working of a two stroke diesel engine
6.12. Illustrate the working of a two stroke petrol engine
6.13. Compare two stroke and four stroke engines
6.14. Compare diesel and petrol engines
6.15. Sketch the valve timing diagram for a four stroke diesel engine
6.16. Sketch the valve timing diagram for a two stroke petrol engine
6.17. Sketch the fuel circuit of a diesel engine
6.18. Illustrate the working of a fuel pump
6.19. Illustrate the working of a fuel injector
6.20. Sketch the fuel circuit of a petrol engine
6.21. Illustrate the working of a Zenith carburettor
6.22. State the necessity of engine cooling
6.23. Classify cooling systems
6.24. Illustrate air cooling system and state its practical applications
6.25. Illustrate water cooling system with a radiator and circulating pump and state its practical applications
6.26. Compare air and water cooling systems
6.27. State the functions of ignition system
6.28. Illustrate the working of a Coil ignition system, and state its practical applications
6.29. Illustrate the working of a Magneto ignition system, and state its practical applications
6.30. Compare Coil and Magneto ignition systems
6.31. State the necessity of lubrication in IC engines
6.32. Classify lubricating systems
6.33. Illustrate splash lubrication system and state its applications
6.34. Illustrate forced lubrication system and state its applications
6.35. State the necessity of engine governing

6.36. Differentiate between a flywheel and a governor
6.37. Explain quality governing system
6.38. Explain quantity governing system
6.39. State the advantages of multi cylinder engines

7. Performance of IC engines

7.1. Write the expressions for Indicated power, brake power, friction power, mechanical efficiency, air standard efficiency, indicated thermal efficiency, relative efficiency, brake thermal efficiency, specific fuel consumption with proper units
7.2. Know the values of mechanical efficiency, air standard efficiency, indicated thermal efficiency, relative efficiency, brake thermal efficiency, specific fuel consumption of a commercially available healthy IC engine
7.3. Solve simple problems on estimation of the above parameters for an engine, from performance test data
7.4. Illustrate the heat balance sheet for an IC engine
7.5. Know the heat balance sheet values of a commercially available healthy IC engine
7.6. Solve simple problems on heat balance sheet for an IC engine from performance test data
7.7. Explain the principle of Morse test, and state its limitations
7.8. Solve simple problems on Morse test from engine test data
7.9. Write the expression for minimum air required for complete combustion of a given fuel
7.10. Solve simple problems on estimating the minimum air required for complete combustion of a given fuel
7.11. Estimate the percentage of gaseous constituents in the flue gases obtained after complete combustion of a given fuel
7.12. Name the gaseous pollutants in the flue gases released from an IC engine
7.13. Know the commercially available equipment for pollution check on an IC engine

8. Air Compressors

8.1. Name the practical applications of compressed air
8.2. Classify compressors
8.3. Differentiate between single acting and double acting compressors
8.4. Compare Reciprocating and Rotary compressors
8.5. Illustrate the working of single stage, single acting, reciprocating air compressor
8.6. Draw the theoretical indicator diagram for the above compressor
8.7. Write the expressions for theoretical work and power required to drive the compressor
8.8. Solve simple problems on single stage, single acting reciprocating air compressor
8.9. State the advantage of multi stage compression
8.10. Draw the layout of two stage, single acting reciprocating air compressor
8.11. Draw the theoretical indicator diagram for the above compressor
8.12. State the conditions for minimum work on the above two stage compressor
8.13. Write the expression for theoretical minimum work for the above two stage compressor
8.14. Solve simple problems on two stage, single acting reciprocating air compressor
8.15. Illustrate the working of a centrifugal compressor
8.16. Illustrate the working of an axial flow compressor
8.17. Illustrate the working of a vane type rotary compressor
8.18. Define volumetric efficiency of an air compressor
8.19. Know the range of volumetric efficiency for a commercially available healthy compressor
8.20. Explain the calculation of volumetric efficiency of a reciprocating air compressor from test data
8.21. Solve simple problems on calculation of volumetric efficiency of a reciprocating air compressor

COURSE CONTENT

1. Perfect gas laws

1.1. Perfect Gas Laws – Boyle's law, Charles's Law, Avogadro's law, Joule's law

1.2. Characteristic and universal gas equations (derivations omitted) – relationship between universal and characteristic gas constants

1.3. Specific heats of perfect gas at constant pressure and at constant volume -Regnault's law- relationship between the two specific heats and characteristic gas constant (derivation omitted)

1.4. Simple problems on gas laws and gas equations

2. Fundamentals of Thermodynamics

2.1. Definitions for system, boundary, surroundings, universe, working fluid

2.2. Types of thermodynamic systems – closed, open and isolated systems with examples

2.3. Properties of system- intrinsic and extrinsic properties with examples - definitions for properties like pressure, volume, temperature, enthalpy, internal energy, density, with their units - definitions for quasi-static work, flow work

2.4. Definitions for thermodynamic State, Path, Process and Cycle – their graphical representation – concept of reversibility and conditions for reversibility of a process and cycle

3. Laws of Thermodynamics

3.1. Zeroth law of thermodynamics – statement and explanation – its significance – difference between heat and temperature - concept of thermal equilibrium

3.2. First law of thermodynamics – its significance – differences between heat and work forms of energy – Joule's constant – first law applied to a cycle – simple problems on heat and work conversions in process and cycle

3.3. Non flow energy equation (NFEE) (without proof) – simple problems on the application of NFEE

3.4. Steady flow energy equation (SFEE) (without proof) - simple problems on the application of SFEE

3.5. Limitations of First law of thermodynamics –development of second law of thermodynamics – its significance - Clausius and Kelvin-Planck statements of second law - concept of heat engine, refrigerator and heat pump -thermal efficiency of a heat engine - simple problems on application of second law

3.6. Definitions for availability and unavailability – concept of change in entropy – expression for change in entropy (without proof) – units of change in entropy – significance of change in entropy

4. Thermodynamic processes on gases

4.1. Introduction to popular thermodynamic processes – their mathematical representation – expressions(without proof) for change in enthalpy, change in internal energy, work transfer, heat transfer, and change in entropy in these processes - representation of these processes on p -V and T-s diagrams - simple problems on the following processes:

4.2. Isochoric process

4.3. Isobaric process

4.4. Hyperbolic process

4.5. Isothermal process

4.6. Isentropic process

4.7. Polytropic process

4.8. Isenthalpic process

5. Air standard cycles

5.1. Meaning of air standard cycle –introduction to popular air standard cycles and their practical applications

5.2. Carnot cycle – representation on p-V and T-s diagrams - assumptions made – expression (derivation omitted) for thermal efficiency – simple problems

5.3. Otto cycle – representation on p-V and T-s diagrams - assumptions made – expression (derivation omitted) for thermal efficiency – simple problems
5.4. Diesel cycle – representation on p-V and T-s diagrams - assumptions made – expression (derivation omitted) for thermal efficiency – simple problems
5.5. Reasons for the highest efficiency of Carnot cycle over other cycles working between same temperature limits.

6. Internal Combustion Engines

6.1. Heat engines – classification– comparison of EC and IC engines - classification of IC engines – layout of an IC engine –functions of principal parts - materials used for the parts - fuels used in IC engines – commercially available fuels – higher and lower calorific value of fuels
6.2. Layout of four stroke diesel/petrol engine– working cycle - layout of two stroke diesel/petrol engine – working cycle – comparison of four stroke and two stroke engines - comparison of diesel and petrol engines- valve timing diagrams for two stroke and four stroke diesel/petrol engines
6.3. Layout of fuel system for diesel engine – functions of principal components – working of fuel pump and injector (line sketches only)- layout of fuel system for petrol engines – functions of principal components - working of a Zenith Carburettor (line sketch only)
6.4. Cooling systems –layout of air cooling system–layout of water cooling system with radiator and forced circulation (line sketches only) - comparison of air cooling and water cooling systems
6.5. Ignition systems – layout of coil ignition system –layout of magneto ignition system - comparison of the two systems
6.6. Lubricating systems –layout of splash lubrication –practical applications – layout of forced lubrication system – practical applications
6.7. Governing systems – difference between governor and flywheel – quality and quantity methods of governing and their applications
6.8. Need of multicylinder engines – advantages over single cylinder engines

7. Performance of IC engines

7.1. Expressions (without proof) for Indicated power, brake power, friction power, mechanical efficiency, air standard efficiency, indicated thermal efficiency, relative efficiency, brake thermal efficiency, specific fuel consumption – typical values for a healthy engine - Simple problems on the calculation of the above
7.2. Heat balance sheet – typical layout for a healthy IC engine - simple problems on heat balance
7.3. Morse test – its applications – simple problems
7.4. Expressions (without proof) for minimum air required for complete combustion of a given fuel – simple problems - flue gas analysis for an IC engine given the composition of the fuel (minimum air case only) – simple problems
7.5. Gaseous pollutants in flue gases – need for pollution control – commercially available equipment for pollution check

8. Air Compressors

8.1. Uses of compressed air – types of air compressors – layout of single stage, single acting, reciprocating air compressor - construction and working – indicator diagram
8.2. Formulae for work done and power required- simple problems on calculation of work and power required
8.3. Advantage of multistage compression - layout of two stage, single acting reciprocating air compressor – indicator diagram - conditions for minimum work (without proof) - formulae for work done and power required – simple problems
8.4. Rotary compressors – types – descriptive treatment of centrifugal compressor, axial flow type compressor and vane type compressors
8.5. Volumetric efficiency of a compressor – typical value for a healthy compressor – simple problems on estimation of volumetric efficiency of a compressor

REFERENCE BOOKS

Sno	Title of the Book	Author	Publisher
1	Elements of Heat Engines, Vol-I, II, III	R.C. Patel and C.J. Karamchandani	Acharaya Publications
2i	Thermal Engineering	R.S.Khurmi	S.Chand

Subject title : **Production Technology-I**
Subject code : **M- 304**
Periods per week : **05**
Periods per semester :**75**

TIME SCHEDULE

SNo.	Major Topics	No. Of Periods	Weightage	SAQ	EAQ	Unit test Bifurcation
1	Lathe and Lathe work	16	16	02	01	Unit Test-I
2	Production Lathes	08	13	01	01	
3	Shaper, Slotter, Planner	12	16	02	01	
4	Broaching Machine	05	10	-	01	Unit Test-II
5	Cutting Fluids, Coolants and Lubricants	06	13	01	01	
6	Welding	16	26	02	02	
7	Metrology	12	16	02	01	
Total		**75**	**110**	**10**	**08**	

OBJECTIVES

On the completion of the course the students should be able to*:*

1. Lathe & Lathe Work

1.1. State the working principle of lathe.
1.2. Write classification of lathes.
1.3. Draw the line diagrams of engine lathe.
1.4. Identify the parts of lathe.
1.5. Describe the functions of each part in lathe.
1.6. Indicate the specifications of a lathe.
1.7. List out the various operations performed on lathe including special operations.
1.8. Illustrate the methods of taper turning .
1.9. Calculate the included angle for taper turning.
1.10. List out different work holding devices.
1.11. Explain the Nomenclature of Lathe (single point) tool.
1.12. State functions of various angles.
1.13. Tool signature.

2. Production Lathes

2.1. Identify various types of Production lathes.
2.2. Illustrate the working principle of turret lathe, Capstan, Automatic and Semi- automatic lathes & copying lathes.
2.3. Know the differences between automatic and semi-automatic lathes.
2.4. Know the need of copying lathes.
2.5. State the advantages and applications of production lathes.

3. **Illustrate the working of Shaper, Slotter, Planer.**

3.1. State the working principles of these machines with line sketches.

3.2. Illustrate the constructional details of the machines.
3.3. Explain the functions of important parts of the machines.
3.4. List out the operations performed on these machines.
3.5. State the specifications of each machine
3.6. Name the various work holding and tool holding devices used in the above machines
3.7. Explain the principle of quick-return mechanism as applied to shaper/planer.
3.8. Describe the different methods of obtaining quick return motion.
3.9. Explain the principle of hydraulic drive with the help of a line diagram applied to shaper.

4. Broaching Machine

4.1. Define Broaching.
4.2. Illustrate the constructional details of the machines.
4.3. Categorise the broaching machines.
4.4. Illustrate the working of the broaching.
4.5. State the advantages & limitations of broaching

5. Cutting Fluids, Coolants & Lubricants.

5.1. State the properties of cutting fluids and coolants.
5.2. Mention the types of fluids.
5.3. State the composition of cutting fluids and coolants.
5.4. List out the relative merits of the cutting fluids and coolants.
5.5. Select the proper cutting fluids and coolants for various machining operations.
5.6. Classify the Lubricants.
5.7. Identify various properties of Lubricants.

6. Understand the different Welding Methods and Techniques.

6.1. State the necessity of welding.
6.2. Classify the welding processes.
6.3. State the advantages and limitations of welding.
6.4. Explain the principle of arc welding.
6.5. Identify the tools and equipment of Arc welding.
6.6. Choose the proper electrodes for given metals.
6.7. Explain the principles of gas welding.
6.8. Identify the tools and equipment of oxy-Acetylene Welding.
6.9. Explain different welding procedures in arc and gas Welding.
6.10. Define the terms soldering & brazing.
6.11. Differentiate soldering from brazing.
6.12. Explain the principles of soldering & brazing.
6.13. Select correct soldering materials for a given job.
6.14. Explain soldering / brazing techniques.
6.15. Identify the gas cutting equipment.
6.16. State the principle of flame cutting.
6.17. State the relative advantages of flame cutting over other types of cutting.
6.18. List out various (special) modern welding techniques.
6.19. State in brief the principle of modern welding techniques.
6.20. Explain the principle of TIG and MIG welding
6.21. Know the principles of fabrication and erection of mechanical structures

7. Metrology

7.1. Identify various linear and angular measuring instruments.
7.2. Explain the principle of working of (at least 4 types) comparators with sketches.
7.3. Predict the amount of measuring accuracy using the comparator.
7.4. Identify the in-accuracies in surface finish.
7.5. Suggest the surface finish measuring instrument.
7.6. State the use of measuring microscope.
7.7. State the principle of working of interferometer.

COURSE CONTENTS

1. Lathe and Lathe Work :

1.1. Explain the Working Principle of Lathe -Types of Lathe
1.2. Constructional details of Engine lathe with line diagram
1.3. Specifications of Lathe,
1.4. Brief explanation of the turning operations-Turning, facing, thread cutting knurling, forming drilling, boring, reaming, key way cutting.,
1.5. Taper turning methods – form tool methods, tailstock set-over method, compound rest method, taper turning attachment –
1.6. Lathe accessories -, work holding devices and tool holding devices.
1.7. Lathe tool terminology –Geometry- Tool signature
1.8. Functions of tool angles

2. Production Lathes :

2.1. Turret lathe: Sketch – Operation – Advantages.,
2.2. Capstan Lathe: Sketch – Operation – Advantages
2.3. Comparison of Engine (Centre lathe) , Turret and Capstan lathe.
2.4. Semi Automatic lathe – Features
2.5. Automatic Lathe – Features
2.6. Copying lathe – applications.,

3. Shaping, Slotting, Planning Machines.

3.1. Layout of a shaper machine – specifications - working principle – applications
3.2. Layout of a Slotting machine – specifications -working principle – applications
3.3. Layout of a Planer machine – specifications -working principle – applications
3.4. Machining operations on the above machines – illustrations
3.5. Work holding and tools holding devices (Basic principles only. Sketches not included)
3.6. Driving mechanisms - Quick return arrangement: Crank & slotted lever mechanism – Whitworth mechanism – Hydraulic drive.

4. Broaching Machines

4.1. Introduction to broaching - Types of broaching machines – Horizontal type (Single ram & duplex ram) Vertical type, Pull up, pull down, and push down
4.2. Elements of broach tool, broach teeth details – nomenclature – types –
4.3. Tool materials

5. Cutting Fluids & Lubricants

5.1. Introduction. - Types of cutting fluids, Fluids and coolants required in turning, drilling, shaping, sawing & broaching,
5.2. Selection of cutting fluids, methods of application of cutting fluid.
5.3. Classification of lubricants (solid, liquid, gaseous),Properties and applications of lubricants.

6. Welding

6.1. Introduction - Advantages and limitations of welding
6.2. Classification of welding processes (IS 812), Principles of Arc Welding. ,Arc welding equipment
6.3. Choice of electrodes for different metals.

6.4. Principle of gas (Oxy – acetylene) welding ,Equipment of gas welding, Welding techniques (viz. Leftward, rightward etc.,),
6.5. Soldering and Brazing techniques. Types and applications of solders & fluxes ,
6.6. Various flame cutting processes. Advantages and limitations of flame cutting
6.7. Modern welding methods, (Submerged, ultrasonic, welding),
6.8. MIG & TIG Welding, Principle of thermit welding.
6.9. Fabrication and erection of mechanical structures *(NOTE : The subject teacher should organise an industrial visit to familiarise the student with the principles of fabrication and erection of mechanical structures)*

7. Metrology.

7.1. Linear measurement- Slip gauges and dial indicators,
7.2. Angle measurements: Bevel protractor, Sine Bar, Angle Slip Gauges
7.3. Comparators: a) Mechanical b) Electrical c) Optical d) pneumatic
7.4. Measurement of surface roughness: methods of measurements by Comparison, tracer instruments and by interferometer
7.5. Measuring Microscope - Interferometer

REFERENCE BOOKS

1. Welding Technology Little
2. Elements of Work Shop Technology vol. I & II Hazra Choudry
3. Engineering Metrology Jain
4. Manufacturing technology P N Rao (MGH Pub)
5. Welding Technology Parmar,

Subject Title : Basic Electrical Engineering & Electronics
Subject Code : M-305
Periods/Week : 05
Periods per semester : 75

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions	Unit Test bifur-cation
1.	Electrical engineering fundamentals	15	26	02	2	Unit Test – I Up to 3.9 of objectives
2.	D.C. Machines	15	21	02	1½	
3.	A.C. Fundamentals & A.C. Machines	20	34	03	2 ½	
4.	Semi Conductors	10	13	01	1	Unit Test - II
5.	Electrical measuring instruments & Safety procedures	15	16	02	1	
Total		**75**	**110**	**10**	**08**	

OBJECTIVES

Up on completion of course the student shall be able to

1.0 Comprehend Basic Electrical Fundamentals.

1.1 Define Ohm's Law.
1.2 State the Laws of Resistance.
1.3 State work, power and energy, with units.
1.4 State and explain Kirchhoff ' s laws.
1.5 Simple Problems on the above.
1.6 Define
  a. Magnetic field strength
  b. Flux
  c. Permeability
  d. Reluctance
1.7 Define
  a. Electric field
  b. Electric field intensity
  c. Permittivity
1.8 State capacitance.
1.9 State Faradays laws of Electro Magnetic Induction. (no problems)
1.10 Explain dynamically and statistically induced E.M.F. (no problems)
1.11 State Lenz's Law. (no problems)
1.12 Explain Fleming's right hand rule. (no problems)
1.13 Explain inductance
  a. Self inductance
  b. Mutual inductance
  c. Coefficient of coupling
1.14 Solve problems on self and mutual inductances.
1.15 Explain energy stored in a magnetic field.

2.0 Understand D.C. Machines.

2.1 Explain working principle of D.C. Generator.
2.2 Constructional features of D.C. Generator and materials used.
2.3 (a) List the type of D.C. Generators.
(b) Draw schematic diagram of each type.
2.4 (a) Write formula for E.M.F equation of a D.C.Generator [no derivation]
(b) state the relation between currents and voltages for different types of D.C generators.
2.5 Label the terminals of a D.C. Generator for armature, field and inter pole windings.
2.6 Sketch the connection of welding generator
2.7 Explain the principle of operation of D.C. Motor.
2.8 (a) List out types of motors.
(b) Draw Schematic diagram of each type.
2.9 (a) Explain back e.m.f.
(b) State the relation between currents and voltages.
2.10 Write formula for speed of D.C. Motor in terms of supply voltage, current and flux.
2.11 Explain speed control of D.C. Motors.
(a).. Field control (b). Armature control
2.12 List the applications of D.C. motors

3.0 Understand A.C. Fundamentals and A.C.Machines

3.1 Explain
i) Alternating current
ii) Amplitude (Peak Value)
iii) Time Period
iv) Frequency
v) Instantaneous value
vi) Average value
vii) R.M.S Value
viii) Form Factor
3.2 Explain graphical and vector representation of alternating quantities.
3.3 Explain phase, phase difference.
3.4 State power in an A.C. circuit and power factor [No derivation]
i) Pure resistance
ii) Pure inductance
iii) Capacitance
3.5 Explain single phase series circuit consisting R-L, R-C, and R-L-C.
3.6 Calculate the impedance, current, PF ,Power and Voltage drops in a given (R-L-C) series circuit.
3.7 Explain poly phase and 3 phase system.
3.8 Explain phase difference in 3 phase system.
3.9 State Star-Delta connection.
3.10 Explain the Construction & working principle of alternator.
3.11 State frequency and speed relations.
3.12 Explain working principle of transformer And rating of transformer.
3.13 Write relation between turns ratio, Voltage ratio and current ratios
3.14 Describe with sketch a welding Transformer.
3.15 Explain three phase induction motor working Principle.
3.16 Explain constructional features of – 3 phase Induction motors.
a. Squirrel cage induction motor.
b. Wound rotor induction motor.
3.17 State the types of Starters used for A.C.Machines
3.18 Explain forward and reverse running of Induction motor.

3.19 State the application of 3 phase induction Motor.
3.20 Explain the working principle of single Phase induction motor.
3.21 List out types of single phase induction Motors.
3.22 Sketch circuit diagram for single phase Induction motors.
3.23 Explain forward and reverse running of Single phase induction motor.
3.24 Applications of single phase induction Motors.

4.0 Understand the Principles of Semi-Conductor Devices.

4.1 Classify materials as conductor, semi-conductors and insulators.
4.2 Distinguish between intrinsic and extrinsic semiconductors.
4.3 Describe the formation of P- type and N- type materials.
4.4 Identify majority and minority carries in P&N type materials.
4.5 Explain the formation of PN Junction diode.
4.6 Describe the working of PN junction diodes with forward bias & reverse bias.
4.7 Understand the working of PNP & NPN transistors
4.8 Draw the different transistor configuration.
4.9 Sketch the input & output characteristics of C.B., C.E & C.C. configuration.
4.10 Describe the operation of Zener diode.
4.11 Distinguish between Zener & Avalanche break – down.
4.12 Explain the operation of LED, LCD & the materials used.

5.0 Understand Electrical Measuring Instruments and Safety Procedures.

5.1 Explain construction and working principle of moving Coil ammeter and volt meter.
5.2 Explain construction and working principle of moving iron ammeter and voltmeter.
5.3 Explain construction-working principle of dynamometer type wattmeter.
5.4 Explain construction and working principle of A.C. single phase induction type energy meters.
5.5 Sketch connection diagram of single phase energy meter with load.
5.6 Explain effect of electrical shock and burn.
5.7 State procedure to be adopted in case of electric shocks.
5.8 State purpose of earthling of electrical equipment and machinery.
5.9 Describe the procedure for pipe earthling.

COURSE CONTENT

1.0 Basic Concepts and Electro Magnetic Induction

1.1 Definitions : Ohm' Law, Laws of resistance work, power, energy with units.
1.2 Kirchoff's Laws – Simple problems.
1.3 Definitions and units magnetic field strength, flux, flux density, permeability, reluctance.
1.4 Definitions and units electric field, field strength, permittivity, capacitance.
1.5 Faraday's laws of Electro – magnetic induction.
1.6 Dynamically and statically induced e.m.f.
1.7 Lenz's Law, Fleming's right hand rule.
1.8 Problems on above.
1.9 Inductance – self and mutual – coefficient of coupling.
1.10 Energy stored in a magnetic field.

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2.0 D.C. Machines

2.1 **D.C. Generators**

a) Principle of operation.
b) Parts of generator and materials use.
c) Types of generators and schematic diagrams.
d) E.M.F equation (No derivation) and voltage current relations.

e) Nomenclature used for determining armature, field and interpole windings etc.
f) Welding Generator.

2.2 D.C. Motors

a) Principle of operation.
b) Types of motors and schematic diagrams
c) Back e.m.f and speed equation and relation between voltages and currents.
d) Speed control – field and armature control.
e) Applications of motors.

3.0 A.C. Fundamentals and Machines

3.1 Definition – alternating current, voltage amplitude, time period frequency, instantaneous value, Average value, r.m.s. value, form factor.
3.2 Graphical and vector representation of Alternating quantities.
3.3 Phase difference.
3.4 Power in A.C. Circuits and power factor (No Derivation).
3.5 Nature of current when alternating voltage is applied to pure resistance, inductance and capacitance – magnitude of current, power factor, power factor angle and power.
3.6 Single Phase A.C. Series Circuits.
3.7 Single phase series circuits – calculation of impedance, current , power factor, power and voltage drops.
3.8 3 – phase circuits
a) Definition of poly – phase and 3 phase circuits.
b) Phase difference in 3 phase system.
c) Star and delta connections, definitions of phase values and line values.
3.9 Alternators – principle of working.
3.10 Constructional features of alternators.
3.11 Speed and frequency relations.
3.12 Transformers working principle.
3.13 Single phase transformers.
a) Voltage ratio b) Current ratio
c) Turns ration.
3.14 Welding transformer.
3.15 Phase Induction Motor
a) Working principle of induction motor.
b) Construction of induction motor
i) Squirrel cage induction.
ii) Wound Rotor induction motor.
c) List the types of Starters used in A.C.machines.
d) Forward and reverse running of Induction motors.
3.16 Single phase induction motors.
a) Types of single phase induction motors.
b) Circuit diagram of each type of single Phase induction motor.
c) Forward and reverse running of single Phase induction motors.
d) Applications of single phase induction Motors.

4.0 Semi – Conductors.

4.1 Semi – conductors – N-Type, P-type.
4.2 Behaviour of PN Junction diode
4.3 Introduction of PNP, NPN Transistors.
4.4 Transistor configuration – Zener diodes.
4.5 Basic Concepts of LED & LCD

5.0 Electrical Measuring Instruments & Safety Procedures

5.1 Construction and principle of operation of moving coil permanent magnet type ammeter and voltmeter and moving iron ammeter and voltmeter.

5.2 Construction and working principle of

a) Dynamometer and wattmeter.
b) A. C. Single phase induction type Energy meter.
c) Connection diagram of single phase energy meters with load

5.3 Safety Procedures.

a) Effects of shock and burns.
b) Procedures to be adopted in case of electrical shocks.
c) Earthing of electrical equipments.

REFERENCE BOOKS

1.	B.L.Theraja.	-	A Text Book of Electrical Engg. and Electronics.
2.	V.K. Mehtha.	-	Principles of Electronics
3.	B.R. Gupta	-	Fundamentals of Electrical Engg.
4.	S.L.Uppal	-	A Text Book of Elec.Engg & Electronics.

Machine Drawing

Subject Title : Machine Drawing
Subject Code : M-306
Periods/ Week : 06
Periods/Semester : 90

TIME SCHEDULE

Sl.No	Major Topics	Periods	Weightage of Marks	Short answer Questions	Essay type Questions
1	Introduction	06	-	-	-
2	Fastening Devices	18	10	02	-
3	Assembly Drawings	39	80	-	02
4	Piping Layouts and Joints	15	05	01	-
5	Welding Fabrication Drawings	12	05	01	-
	Total	**90**	**100**	**04**	**02**

Note:- In the end examination, candidate has to answer all questions in Part- A and one question out of two in Part-B
I.S/B.S latest specification should invariably be followed in all topics.

OBJECTIVES

Upon completion of the course the student shall be able to;

1.0 Understand the importance of machine drawing
- 1.1. Know the importance of Machine drawing.
- 1.2. Review of 1st angle and 3rd angle Projections
- 1.3. Review of Orthographic Projections and Sectional Views.

2.0 Know about fastening devices
- 2.1. Draw the standard thread profiles.
- 2.2. Draw bolted connections to standard proportions.
- 2.3. Draw different types of screws.
- 2.4. Draw different types of rivets and riveted connections.
- 2.5. Draw different types of keys and cotters.

3.0 Understand the assembly drawing practice and procedure
- 3.1. List the sequence of steps for preparing assembly drawing.
- 3.2. Practice the assembly drawing for the given components drawing.
- 3.3. Prepare the list of parts.

4.0 Understand the piping layouts and joints.
- 4.1. State the distinction between pipes and tubes.
- 4.2. Identify the common components of a piping layout.
- 4.3. Identify the conventional symbols used for the various components of piping layout.
- 4.4. Prepare single line and double line diagrams of piping layouts.
- 4.5. Draw the assembly drawing and sectioned views of pipe joint.
- 4.6. Explain the use of packing material in joint.

5.0 Appreciate the welded fabrication drawing.

5.1. Identify the different types of welds and their symbolic representation as per B.I.S., SP-46-2003
5.2. Identify the elements of welding symbol and their standard location on the symbol.
5.3. State welding process to be used, surface contour and finish of weld when given in symbolic form.
5.4. Practice the Preparation of working drawing of welded fabrications.

COURSE CONTENT

1.0 Introduction

1.1. Importance of Machine Drawing.
1.2. Brief revision of 1st and 3rd angle projections
1.3. Understand the concepts of Orthographic projections and Sectional views.

2.0 Fastening Devices

2.1. Temporary and Permanent fastenings and their areas of application-thread nomenclature, forms of screw thread profiles, Metric, B.A., Acme, Knuckle, etc.
2.2. Bolts and Nuts: Specification of bolts and nuts, Different types of bolted joints (like using through bolts, studs, screws etc.,) in different applications. Purpose of lock nuts and their Types.
2.3. Keys and cotters: Types of keys and cotters: Difference between key and cotter -uses.
2.4. Rivets and Riveted joints: Types, proportions and specification of rivets: Different types of riveted joints: Lap, Butt-single row, double row etc., chain and zigzag riveting – calculation of diameter of rivet: Pitch and arrangement of rivets in row – use of standard proportions.

Drawing Plate: 1

1. Exercise on Orthographic projections and Sectional views.
2. Thread Nomenclature and forms of screw thread profiles.
3. Exercises in drawing – bolted connections using standard proportions.
4. Drawing of various types of lock nuts & types of keys indicating their proportionate dimensions.
5. Exercise in drawing riveted joints using standard proportions: Single row, Double row (chain and zigzag) in lap and butt joints (single & double strap).

3.0 Assembly Drawings

3.1. Need and functions of assembly and detailed drawings.
3.2. Steps in preparing assembly drawings.
3.3. Bill of materials and parts list.
3.4. Exercises in preparing assembly drawings of commonly available engineering components.
3.5. **Drawing Plate: 2**

Draw the views / sectional views of

Socket and spigot joint	**Sleeve and cotter joint**	**Stuffing box**
Knuckle Joint assembly	**Bush Pin type flanged coupling**	**Muff coupling (solid & split)**
Universal coupling	**Foot step bearing**	**Plummer block**
Eccentric	**Lathe tool post**	**Lathe tail stock**
Non return valve		

4.0 Piping layouts

4.1. Classification of pipes and tubes.
4.2. Components of pipes lay-out.
4.3. Screw fitting bend, elbow, tee, lateral Cross-nipple, reducing socket and plug.
4.4. Unions: Screwed ground and flanged.
4.5. Valves: Gate valve: angle valve, check valve.
4.6. Various conventional symbol used for the above components.

Drawing Plate: 3

1. Single line diagram of pipe layout, two exercises.
2. Double line diagram of pipe layout, one exercise.
3. Cast iron flanged pipe joint, spigot and socket joint, hydraulic pipe joint, expansion joint, screwed joint, union joint - draw half sectional elevation and end view.

5.0 Welded fabrication drawings

5.1. Different types of weld and their basic symbols including sectional representation as per table of I.S. standards, fillet, square butt, single V-Butt, double V-Butt, single bevel butt, double bevel butt, stud, bead (edge or seal), spot, seam.

5.2. Elements of welding symbol and their standard location, the symbol as per IS standards reference Code, arrow head, weld symbol, supplementary symbol, dimensions of welds, method of welding process, special reference.

5.3. Significance of arrow & position of arrow head significance of reference line as per I.S. standards with reference to fillet, V-Butt and stud welds.

5.4. Supplementary symbols and special instructions: Surface of reference line; as per I.S. standards with reference to fillet, V-Butt and stud welds.

5.5. Dimensions of welds: length, location and spacing of welds as per I.S., B.I.S., standards with showing dimensions required on a welding.

5.6. Need of special reference

Drawing Plate: 4

1. Drawing tables and figs. Referred in the contents above taking form I.S. standards.
2. Dimensioning a given welding drawings as per I.S., SP-46-2003.
3. Preparing working drawing of welding fabrication from given data.

REFERENCE BOOKS

1. T.S.M & S.S.M in respect of **Technical Drawing by TTTI, Madras**
2. Machine Drawing by **A.C. Parkinson**.
3. Machine Drawing by **Jones & Jones.**
4. Machine Drawing by **N.D. Bhat**.
5. Machine Drawing by **R.B. Gupta.**
6. Engineering drawing practice for schools & colleges: **SP-46-2003**.
7. Machine Drawing by **Bhattacharya** (Oxford Publishers).
8. Machine Drawing by **Ajeeth Singh** (MGH Publishers)
9. Machine Drawing by **N.Siddeswar, Kannaih, Sastri**. (MGH Publishers)

Fuels Lab and Electrical Engineering Lab

Subject Title : Fuels Lab and Electrical Engineering Lab
Subject Code : M – 307
Total No. of Periods per week : 1 ½ + 1 ½
Total Periods per Semester : 45

TIME SCHEDULE (FUELS LAB)

S. No.	Major Components	Periods
1.	Flash & Fire point tests	06
2.	Viscosity measurement	06
3.	Calorific value tests	04 ½
4.	Carbon residue test	03
5.	Calibration of pressure gauge	03
	Total No. Periods	**22 ½**

TIME SCHEDULE (ELECTRICAL ENGG LAB)

S. No.	Major Components	Periods
1.	Identification of Terminals and Insulation resistance of AC & DC Machines usingTest Lamp, Multimeter and Megger	06
2.	Study of DC & AC Machines starters	06
3.	Speed Control of DC Shunt Motor by Field and Armature Control Method	04 ½
4.	Load Test on DC Shunt Motor .	03
5.	Load Test on AC, 3-phase Induction Motor	03
	Total No. Periods	**22 ½**

NOTE:

1. **The course work is compulsory in both labs.**
2. **The Practical end examination consists of 1 ½ hours examination (30 marks) in Fuels Lab and 1 ½ hours (30 marks) examination in Basic Electrical Engineering Lab.**

OBJECTIVES (FUELS LAB)
Up on Completion of the course the student shall be able to:

1.0 Understand the determination of flash and fire point of a given sample of fuel using given apparatus

1.1 Define the flash and fire points of fuels and lubricants.
1.2 Distinguish between “open” and “close” tests.
1.3 Identify the Parts of apparatus
1.4 Explain the function of each component part
1.5 Handle the apparatus
1.6 Manipulate the apparatus
1.7 Perform the precise operations to determine flash and fire point of given sample of fuel
1.8 Record the observations
1.9 List the Precautions and safety procedures
1.10 Explain the need and scope of the Experiment in industry

2.0 Understand the determination of Viscosity of a given sample of oil using given apparatus

2.1 Explain the properties of lubricating oil

2.2 Explain the viscosity of oil and its units
2.3 Explain the importance of viscosity as applied to Oils.
2.4 Relate the Absolute viscosity and kinematic viscosity
2.5 Classify the viscometers
2.6 Identify the parts of viscometer
2.7 Handle the apparatus
2.8 Manipulate the apparatus
2.9 Perform the precise operations to record Redwood seconds
2.10 Use empirical formulae to determine the Kinematic & Absolute viscosities of given Oil.
2.11 State the effect of temperature on these oil properties.
2.12 Draw the graph between the temperature and viscosities.
2.13 Explain the need and scope of the Experiment

3.0 Understand the determination of Calorific value of a given sample of fuel using given apparatus

3.1 Explain the phenomenon of combustion of fuel
3.2 Explain the calorific value of fuel
3.3 State the differences between higher and lower Calorific values of fuels.
3.4 List the types of fuels
3.5 Identify the various Calorimeters for determining the Calorific values of Solid, Liquid and gaseous fuels.
3.6 Indentify the parts of Junker's Gas Calorimeter
3.7 Handle the apparatus
3.8 Manipulate the apparatus
3.9 Perform precise operations on bomb, Junker's Gas Calorimeter or Boy's Gas Calorimeter to record various parameters
3.10 Determine the Calorific values of solid, liquid and gaseous fuels
3.11 Explain the need and scope of the Experiment

4.0 Understand the determination of amount of carbon residue of a given sample of petroleum product

4.1 Explain the phenomenon of oil evaporation
4.2 Identify the parts conradson tester.
4.3 Handle the apparatus
4.4 Manipulate the apparatus
4.5 Perform precise operations on Conradson tester to record Weights of crucible
4.6 Determine the percentage carbon residue
4.7 Explain the need and scope of the Experiment

5.0 Understand the need and importance of calibration of pressure gauges.

5.1 Define the term pressure
5.2 Explain the function of component parts of Dead weight Pressure gauge tester
5.3 State the principle on which the dead weight pressure gauge tester works
5.4 Handle the apparatus
5.5 Manipulate the apparatus
5.6 Perform precise operations on Dead weight Pressure gauge tester
5.7 Observe and record the pressure due to mass load
5.8 Record the gauge pressure
5.9 Explain the need and scope of the Experiment

OBJECTIVES (Electrical Engineering Laboratory)

Up on Completion of the Laboratory Experiments the student shall be able to:

6.0 Identify of Terminals of the Following DC Machines with the Use of Test Lamp
(a) DC Shunt Motor (ii) DC Series Motor (iii) DC Compound Motor

6.1 Measuring the values of windings of the Following DC Machines with the Use of Multimeter
(a) DC Shunt Motor (ii) DC Series Motor (iii) DC Compound Motor

6.2 Measuring the values of Insulation Resisitance of the Following DC Machines with the Use of Megger.
(a) DC Shunt Motor (ii) DC Series Motor (iii) DC Compound Motor

6.3 Identify of Terminals of the Following AC Machines with the Use of Test Lamp
(a) 3-Phase Squirrel Cage Induction Motor (ii) 3- Phase Slip Ring Induction Motor.

6.4 Measuring the values of windings of the Following AC Machines with the Use of Multimeter
(a) 3-Phase Squirrel Cage Induction Motor (ii) 3- Phase Slip Ring Induction Motor.

6.5 Measuring the values of Insulation Resisitance of the Following DC Machines with the Use of Megger.
(a) 3-Phase Squirrel Cage Induction Motor (ii) 3- Phase Slip Ring Induction Motor.

7.0 Study of Following starters

7.1 Identifying the terminals and its operating function of Three Point starter .
7.2 Identifying the terminals and its operating function of Four Point starter .
7.3 Identifying the terminals and its operating function of DOL (Direct On Line) starter .
7.4 Identifying the terminals and its operating function of STAR/ DELTA starter .

8.0 SPEED CONTROL OF DC SHUNT MOTOR

8.1 Able to Draw the Speed Control Characteristics of Dc Shunt Motor By Armature Control method.
8.2 Able to Draw the Speed Control Characteristics of Dc Shunt Motor By Field flux Control method.

9.0 LOAD TEST ON DC SHUNT MOTOR

9.1 Draw the Performance Characteristics (Speed, Efficiency) of DC Shunt Motor by load test ..
9.2 Understand the Use of Load test on DC Shunt Motor.

10.0 LOAD TEST ON Three Phase Squirrel cage Induction Motor.

10.1 Draw the Performance Characteristics (Speed, Efficiency) of Three Phase Squirrel cage Induction Motor by load test ..
10.2 Understanding the Use of Load test on Three Phase Squirrel cage Induction Motor .

COURSE CONTENT

1. Determination of flash and fire points of various fuels and lubricants using Abel's, Pensky Martin's, and Cleveland's apparatus.
2. Determination of Kinematics and Absolute viscosities of the fuel and lubricating Oils using Redwood & Saybolt viscometers.

3. Determination of Calorific values of Solid and liquid fuels using Bomb Calorimeter.
   Determination of Calorific value of gaseous fuel by using Junker's Gas Calorimeter or Boy's Gas Calorimeter
4. Determination of Carbon residue using Conradson's apparatus.
5. Calibration of a pressure gauge using dead weight pressure gauge tester
6. Identification of Terminals and Insulation resistance of AC & DC Machines using Test Lamp, Multimeter and Megger
7. Study of DC & AC Machines starters.
8. Speed Control of DC Shunt Motor by Field and Armature Control Method.
9. Load Test on DC Shunt Motor.
10. Load Test on Three Phase Squirrel cage Induction Motor.

Material Testing Lab

Subject Title : Material Testing Lab
Subject Code : M-308
Periods/Week : 03
Periods/Semester : 45

TIME SCHEDULE

S.NO	EXPERIMENT TITLE	NO. OF PERIODS
1	Tension test	06
2	Compression test	06
3	Shear test	06
4	Impact test	03
5	Hardness test	06
6	Torsion test on springs	06
7	Flexural test on Simply supported beam	06
8	Study of micro structure of Metals and alloys	06
TOTAL		**45**

OBJECTIVES

Upon the completion of the course the student shall be able to

1. Tension test

1.1. Identify a Universal Testing Machine (UTM)
1.2. State the specifications of the test specimen as per ASTM / IS standards
1.3. Conduct a tension test on the given specimen and calculate
  1.3.1. Elastic limit
  1.3.2. Yield point
  1.3.3. Ultimate point
  1.3.4. Breaking Point
  1.3.5. Percentage elongation
  1.3.6. Percentage reduction in area
  1.3.7. Modulus of elasticity
  1.3.8. Tensile strength
1.4. Plot a stress strain diagram
1.5. State the significance of the test

2. Compression test

2.1. Identify a Compression testing machine (CTM)
2.2. State the specifications of the test specimen as per ASTM / IS standards
2.3. Conduct a compression test on the given specimen and calculate
  2.3.1. Ultimate point
  2.3.2. Compression strength
2.4. State the significance of the test

3. Shear test

3.1. Identify a shear attachment for a UTM
3.2. Know the procedure of conducting direct shear test on UTM
3.3. State the specifications of the test specimen as per ASTM / IS standards
3.4. Conduct a direct shear test on the given specimen using UTM and determine the shear strength of the material.
3.5. State the significance of the test

4. Impact test

4.1. Identify Impact testing machines
4.2. Differentiate between IZOD and CHARPY tests
4.3. State the specifications of the test specimen as per ASTM / IS standards
4.4. Conduct IZOD / CHARPY tests on the given specimen, and determine the impact strength
4.5. State the significance of the test

5. Hardness test

5.1. Identify Brinell's, Rockwell's and Vicker's hardness testing machines
5.2. State the specifications of the test specimen as per ASTM / IS standards
5.3. Conduct Brinell's /Rockwell's /Vicker's hardness test on the given specimen, and determine its hardness
5.4. State the significance of the test

6. Torsion test on springs

6.1. Identify spring testing apparatus
6.2. Apply torsion equation to the case of spring deflection
6.3. Conduct a deflection test on the given spring tension / compression spring and determine the modulus of rigidity of the spring material
6.4. State the significance of the test

7. Flexural test on Simply supported beam

7.1. Identify a beam deflection test apparatus
7.2. Apply theory of bending to the case of beam deflection
7.3. Conduct a defection test on the given simply supported beam and determine the modulus of elasticity of the beam material
7.4. State the significance of the test

8. Study of micro structure of Metals and alloys

8.1. Know the procedure of preparing a specimen for micrographic examination
8.2. Identify the tools & equipment required for the above
8.3. Prepare a specimen for micrographic examination
8.4. Draw the microstructure of the given specimen after microscopic examination
8.5. State the significance of the test

COURSE CONTENT

1) Tension test on mild steel
2) Compression test on wood
3) Direct shear test on mild steel
4) Impact test on mild steel
5) Hardness test on carbon steel
6) Torsion test on steel tension spring
7) Flexural test on wooden beam
8) Microstructure of a) Brass b) Grey cast iron

Workshop Practice-II

Subject Title : Workshop Practice-II
Subject Code : M-309
Periods/Week : 03
Periods per Semester : 45

TIME SCHEDULE

SNo.	Name of Experiment	No of periods allotted
1	**Foundry**	18
	1.1 Solid bearing	3
	1.2 Flange coupling	3
	1.3 Split bearing	3
	1.4 Connecting rod	3
	1.5 V – Pulley	3
	1.6 Gear pulley	3
2	**Machining**	18
	2.1 Plain Turning	3
	2.2 Step Turning	3
	2.3 Taper Turning	3
	2.4 Turning Collars	3
	2.5 Knurling	3
	2.6 Facing	3
3	**Welding**	9
	3.1 Layout of Beads	3
	3.2 Butt joints.	3
	3.3 Lap joints.	3

OBJECTIVES:

1. Obtain skill in the mould preparation
2. Obtain Skill in the casting
3. Obtain skill in the machining Operations
4. Obtain skill in Welding

COURSE CONTENT

1. Foundry (moulding and Casting of)

Moulding and casting of
1.1 Solid bearing
1.2 Flange coupling
1.3 Split bearing
1.4 Connecting rod
1.5 V – Pulley
1.6 Gear pulley

2. Machine Shop (Turning)

Practising the following machining operations

2.1 Plain Turning
2.2 Step Turning
2.3 Taper Turning
2.4 Turning Collars
2.5Knurling
2.6 Facing

3. Welding

Practising the welding operations

3.1 Layout of Beads
3.2 Butt joints.
3.3 Lap joints.

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16

IV Semester

Sub code	C16-Subjects	No of Periods per week		Total periods per semester	Scheme of Examination			
		Theory	Practice		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-401	Engineering Materials	6		90	3	20	80	100
M-402	Hydraulics and Fluid Power Control Systems	6		90	3	20	80	100
M-403	Thermal Engineering II	6		90	3	20	80	100
M-404	Production technology-II	6		90	3	20	80	100
M-405	Design of Machine Elements	6		90	3	20	80	100
PRACTICAL								
M-406	Production Drawing		3	45	3	40	60	100
M-407	Hydraulics & Fluid Power Control Systems Lab		3	45	3	40	60	100
M-408	Communication Skills		3	45	3	40	60	100
M-409	Thermal Engineering Lab		3	45	3	40	60	100
	T O T A L	**30**	**12**	**630**		**240**	**560**	**800**

Engineering Materials

Subject Title : Engineering Materials
Subject Code : M-401
Periods per week : 06
Periods per Semester : 90

TIME SCHEDULE

Sl. No	Major Topics	No. of Periods	Weightage of Marks	Short answer Questions	Essay Type Questions	Unit Test bifur-cation
1	Introduction Mechanical properties of engineering materials	05	05	--	½	Unit Test – I upto 5.3 of objectives
2	Testing of materials	10	13	01	01	
3	Structure of Materials	10	13	01	01	
4	Production of Iron and Steel	10	13	01	01	
5	Iron Carbon Equilibrium Diagram	15	16	02	01	Unit Test - II
6	Heat treatment of Steel	12	16	02	01	
7	Ferrous, Non Ferrous Metals and their alloys, composite materials	20	21	02	01 ½	
8	Powder Metallurgy	08	13	01	01	
	Total	**90**	**110**	**10**	**08**	

OBJECTIVES
Up on completion of the course the student shall be able to

1.0 Introduction, Mechanical properties of engineering materials

1.1 State the importance of various Engineering Materials used in Mechanical processes / industries.
1.2 List the various engineering materials and their applications.
1.3 Define the following Properties. i) Tensile, compressive and shear strength ii) Ductility iii) Hardness iv) Toughness v) Brittleness vi) Impact strength vii) Fatigue and Creep strength

2.0 Testing of Materials

2.1 Differentiate between destructive and non-destructive tests.
2.2 Describe the testing procedure for tensile strength, compression strength, shear strength
2.3 Impact strength, and hardness of metals.
2.4 Describe the procedure for Testing Materials by X- Ray, gamma – Ray, Magnaflux, Ultrasonic and penetrate test.

3.0 Structure of materials

3.1 State the meaning of space lattice.
3.2 Define unit cell.
3.3 Describe the three main types of space lattice.
3.4 State the formation of grains by dendrite growth.
3.5 State the effect of rate of cooling on grain formation.
3.6 State the effect of grain size on mechanical properties.
3.7 Identify the factors promoting grain size.
3.8 Identify important stages in the phenomenon of recrystallisation.

4.0 Production of Iron and Steel

4.1 Name the various raw materials required for production of iron.
4.2 Describe the method of producing Pig Iron in Blast furnace.
4.3 Describe the Puddling furnace to produce wrought iron.
4.4 Explain the process of manufacturing cast iron in Cupola.
4.5 Describe the steps in manufacturing steel by Bessemer process (without sketch), L-D process, Open Hearth (without sketch) and Electric Process

5.0 Iron - Carbon Equilibrium Diagram

5.1 Explain the cooling curves of pure metal.
5.2 Identify the allotropic forms of pure iron with temperatures, their crystal structures.
5.3 Draw the iron carbon diagram, identify various structures of the iron carbon system.
5.4 Locate Eutectic, Peritectic and Eutoctiod points from the Iron Carbon diagram.
5.5 Obtain the composition of phases in a steel/cast Iron from the iron carbon diagram.

6.0 Heat Treatment Processes of Steel.

6.1 State the importance of heat treatment for steels.
6.2 Describe the main features of the various heat treatment operations.
6.3 Differentiate annealing and normalising.
6.4 Describe the effect of cooling rate in hardening.
6.5 State the importance of tempering.
6.6 Explain use of case hardening processes like; carburizing, nitriding and cyaniding

7.0 Ferrous, Non-Ferrous Metals and their alloys, Composite materials

7.1 Classification of Cast Iron – Grey, White, Malleable, Spheroidal – composition, properties and applications.
7.2 State the basis of classification of plain carbon steels.
7.3 List out the application of these steels.
7.4 Describe the need for alloying the steel with other elements.
7.5 State the composition, properties, and industrial applications of alloy steels.
7.6 Identify the need for non-ferrous metals and their alloys in engineering application.
7.7 Describe the properties of –Copper, Aluminum, Tin, Zinc, lead, Nickel, Magnesium and Chromium.
7.8 Indicate the composition, properties, and industrial application of the important – non-ferrous alloys, phosphor bronze, gun metal, alnico, magnalium, Y alloy, babbit metal.
7.9 Introduction to composite materials

8.0 Powder Metallurgy.

8.1 Explain the applications of powder metallurgy as a primary manufacturing process.
8.2 State the important characteristics of metal Powders.
8.3 Explain the methods of producing powders.
8.4 Explain the processes of forming to shape, pressing, centrifugal compacting, extruding, gravity sintering, rolling, isostatic moulding, explosive compacting, hot pressing, spark sintering.

8.5 Explain the finishing operations.
8.6 State the advantages and limitations of powder metallurgy.

COURSE CONTENT

1.0 Introduction, Mechanical properties of engineering materials

1.1 A few Mechanical Engineering Materials, Importance of their study with applications.
1.2 Various mechanical properties of engineering materials - Tensile strength, Compressive strength, Ductility, Malleability, Hardness, Toughness, Brittleness, Impact strength, Fatigue, Creep resistance

2.0 Testing of materials

2.1 Destructive testing tests on UTM to determine tensile, compressive and shear strengths
2.2 Hardness Tests on Brinell & Rockwell Testing machines - Vickers test principle only
2.3 Impact test using Izod & Charpy specimen
2.4 Non destructive testing – Procedure for testing materials by X-ray, gamma ray, magnetic flux and ultrasonic testing.

3.0 Structure of Materials

3.1 Crystals of metals, Space lattices, Unit cell, three main types of metallic space lattices, namely Face Centered Cubic, Body Centered Cubic, Hexagonal Close Packed.
3.2 Crystallisation of metal, formation of grains by dendrite growth, grain boundary, grain size control, effect of grain size on properties – factors

4.0 Production of Iron and Steel.

4.1 Raw materials, iron ores, Lime stone, Coal-their availability in India.
General Survey of Iron and steel making in India.
4.2 Manufacturing of pig iron from blast furnace.
4.3 Wrought iron by pudding furnace.
4.4 Cast Iron from cupola.
4.5 Production of steel by Bessemer (without sketch), L.D. process; Open hearth (without sketch) and Electric processes.

5.0 Iron - Carbon Equilibrium Diagram.

5.1 Cooling curve for pure metal.
5.2 Allotropic forms of pure Iron.
5.3 Iron carbon equilibrium diagram.

6.0 Heat Treatment of Steels.

6.1 Importance of heat treatment.
6.2 Heat treatment processes – annealing, normalizing, hardening, tempering,
6.3 Case hardening processing carburizing, nitriding and cyaniding with specific examples of engineering applications of the above.

7.0 Ferrous, Non- Ferrous metals and their alloys.

7.1 Classification of Cast Iron – Grey, White, Malleable, Spheroidal – Composition, properties and applications.
7.2 Plain Carbon Steels: Effect of carbon in steels, Soft, Mild, Medium and High carbon and also their properties and applications.
7.3 Alloy Steels: Nickel Steels, Chromium steels, 18/8 stainless steel, High Speed Steels, Manganese Steel.
7.4 Properties and uses of Copper, Aluminium, Tin, Zinc, Lead, Nickel, Magnesium and Chromium.
7.5 Phosphor bronze, gun metal composition and uses.
7.6 Alnico, magnalium, Y alloy, babbit metal composition and properties.
7.7 composite materials definition, application, terminology, types of composites

8.0 Powder Metallurgy.

8.1 Primary manufacturing process – definition, important characteristic of metal powders,

8.2 Methods of producing powders.

8.3 Forming to shape – pressing, centrifugal compacting., Extruding, Gravity sintering, Rolling, isostatic moulding, explosive compacting, , sintering, Hot pressing, spark sintering,

8.4 Finishing operation.

8.5 Advantages and limitations of powder metallurgy.

REFERENCE BOOKS

Powder Metallurgy	T.T.T.I, ECH
Material Science	Raghavan.
Physical Metallurgy	Avner
Engineering Metallurgy	T.T.T.I(S.R), ECH

Hydraulics & Fluid Power Control Systems

Subject Title : Hydraulics & Fluid Power Control Systems
Subject Code : M-402
Periods/Week : 06
Periods per Semester : 90

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer Questions	Essay Type Questions	Unit Test Syllabus
1	**Properties of fluids**	10	13	1	1	Unit Test - I
2	**Flow of Liquids**	10	13	1	1	
3	**Flow of liquids through pipes**	10	13	1	1	
4	**Impact of Jets**	10	13	1	1	
5	**Hydraulic Turbines**	10	13	1	1	Unit Test - II
6	**Hydraulic Pumps**	10	13	1	1	
7	**Oil power Hydraulics**	15	16	2	1	
8	**Pneumatics**	15	16	2	1	
	Total	**90**	**110**	**10**	**08**	

1. Properties of fluids

Understand the Fluid properties

1.1 Define fluid
1.2 Classify fluids
1.3 Distinguish between compressible (gases) and incompressible (liquids) fluids
1.4 Distinguish between ideal and real fluids
1.5 State the various units used in fluid mechanics
1.6 Define various properties of fluids and state their units
1.7 Define intensity of pressure
1.8 State units for pressure
1.9 State Pascal's law
1.10 Differentiate between gauge, absolute and vacuum pressures
1.11 Principle and working of bourdon pressure gauge
1.12 Solve problems on pressure measurement by U tube and differential manometers

2. Flow of Liquids

Understands the law of continuity and conservation of Energy in respect of liquids

2.1 Classify fluid flow
2.2 Distinguish between laminar flow and turbulent flow
2.3 Explain the concept of Reynolds number.
2.4 Explain the law of Continuity in case of liquids
2.5 Explain laws of conservation of Energy
2.6 Explain the various types of energies and the total energy.
2.7 Explain the velocity of a flowing liquid
2.8 Write the discharge equation and equation of continuity of flow.
2.9 State Bernoulli's equation
2.10 Explain the working principle of venturimeter, pitot tube, water and current meters
2.11 Define Co-efficient of Velocity (Cv), Co-efficient of Contraction (Cc), Co-efficient of discharge (Cd).
2.12 Solve problems (simple) on law of continuity, Bernoulli's equation, Venturimeter

3. Flow of liquids through pipes

Comprehend power transmission through liquids, flowing in the pipes

3.1 List various losses when liquid flows through pipes
3.2 State laws of fluid friction
3.3 Write the equations for loss of head due to friction in pipes - Darcy's and chezy's formulae
3.4 List various minor losses in pipe flow
3.5 Explain the pipes in series (compound pipe) and equivalent pipe
3.7 Calculate the velocity of flow, discharge and diameter of pipes connecting two reservoirs
3.8 Explain the function of siphon and give reason for limiting the height of the pipes
3.9 Explain how power can be transmitted through pipes carrying liquid under pressure
3.10 Write the condition for maximum power through pipes
3.11 Solve simple problems on power transmission through pipes

4. Impact of jets

Analyse forces, work done and efficiency due to the impact of jets

4.1 Derive expression for force of jet on fixed vertical flat plate, fixed inclined flat plate, and moving flat plate
4.2 Derive expression for the force of jet on a series of plates fixed on the rim of a wheel
4.3 Draw velocity triangles for fixed and moving curved blades
4.4 Derive the expressions for work done, power and efficiency in the above
4.5 Solve simple problems related to the above

5. Hydraulic Turbines

Explain the working of Hydraulic turbines

5.2 Draw the layout of a hydroelectric power station
5.3 Classify water turbines on different criteria
5.4 Explain the construction details and working of Pelton wheel
5.5 Explain the construction details and working of Francis turbine
5.6 Explain the construction details and working of Kaplan turbine
5.7 Explain the draft tube theory
5.8 Explain the governing of water turbines with a legible sketch
5.9 Write the formulae for work done and efficiency of Pelton wheel turbine
5.10 Write the formulae for work done and efficiency of Francis turbine
5.11 Solve simple problems on water turbines

6. Hydraulic Pumps

Explain the working of reciprocating and centrifugal pumps

6.1 Explain the function of hydraulic pumps
6.2 Classify hydraulic pumps
6.3 Explain the principle of operation of reciprocating pumps
6.4 Describe the constructional details of single acting pump with the legible sketch
6.5 Describe the constructional details of double acting pump with the legible sketch
6.6 Explain the concept of slip in a reciprocating pump
6.7 State the effect of velocity and acceleration of fluids in suction and delivery pipes
6.8 Explain the principle of air vessel with respect to reciprocating pump
6.9 Solve simple problems on power required to drive reciprocating pump
6.10 Explain the principle of operation of centrifugal pumps with a legible sketch
6.11 Compare centrifugal pump with a reciprocating pump
6.12 Appreciate the importance of priming in centrifugal pump
6.13 Explain the phenomenon of cavitations and state its effect
6.14 Write the expressions for static and man metric head of centrifugal pump
6.15 Write the formula for work done at the impeller of centrifugal pump
6.16 Explain the various losses and efficiencies of a centrifugal pump

6.17 Solve simple problems on centrifugal pumps

7. Oil Power Hydraulics

Understands the working of basic components of Oil power systems

7.1 List the various applications of oil power systems (Hydraulic brake system, Hydraulic press, Hydraulic shock absorber)
7.2 Know the Basic Components of oil Power system in a hydraulic circuit
7.3 Recognize Symbols of various elements in a Hydraulic circuit
7.4 Explain the working and construction of gear, vane and piston pumps.
7.5 Explain the classification of hydraulic actuators.
7.6 Describe the construction and working of hydraulic actuators (Single Acting, Double Acting, Telescopic and Tandem)
7.7 List different types of valves used in fluid power
7.8 Describe the working and construction of direction control valves (Ball type Check valves, Shuttle valves), Operation of Two-way valves, Three-way valves, Four-way valves
7.9 Describe the working and construction of simple pressure relief valve, pressure reducing valve
7.10 Describe the working and construction of various flow control valves (needle-type flow-control valve, pressure-compensated flow-control valve)

8. Pneumatics

Understands the working of basic components of pneumatic power systems

8.1 Identify and appreciate the application of pneumatic power systems
8.2` Compare oil and pneumatic power systems
8.3 Know the Basic Components in a pneumatic circuit
8.4 Recognize Symbols of various elements in a pneumatic circuit
8.5 Explain Principle and working of Filter, Regulator, Lubricator, Muffler, principle of Air control Valves (Two-way, two-position valves, Four-way, two-position valves)
8.6 Study the seals used in the Pneumatic actuators
8.7 Classify the various types of Pneumatic actuators
8.8 explain the principle and working of Pneumatic circuits for control of single acting cylinders and double acting cylinders
8.9 Know the differences between hydraulic and pneumatic power systems

Course Content

1. Properties of fluids

Definition of fluid; Classification of Fluids: Ideal and Real fluids; Newtonian and Non-Newtonian fluids; Compressible and Incompressible fluids; Fluid properties: Density, specific weight, specific gravity, Specific Volume, viscosity surface tension, compressibility, Bulk Modulus and capillarity; Concept of pressure: Pascal's law. Atmospheric, Vacuum, Gauge and absolute pressures; Measurement of pressure: piezo-meter. U-Tube - manometer, differential manometer and bourdon pressure gauge; Simple problems on properties and pressure measurement;

2. Flow of Liquids

Types of fluid flow- Steady and unsteady flow, Uniform and Non-uniform flow, One,Two and Three dimensional flow, Rotational and irrotational flow, Laminar and Turbulent flow; Concept of Reynold's Number; Basic Principles(Laws) of Fluid Motion: Continuity, Energy and Momentum of liquids; Pressure, potential and kinetic energies of liquids, total energy; Continuity equation for one-dimensional flow. Solving of simple problems based on continuity equation. Bernoulli's equation; Problems on Bernoulli's Equation, Venturi meter and Pitot tube; Definition of C_v, C_c, and C_d ;

3. Flow of liquids through pipes

Major energy losses: Laws of fluid friction. The equations for loss of head in pipes due to friction- Darcy's and Chezy's formula (without Minor losses in pipe flow, problems on pipe friction; Minor energy losses; Hydraulic gradient and total energy lines, Pipes in series and parallel, Equivalent pipes, Siphon, power transmission through pipe, Expressions of transmission efficiency, condition for maximum efficiency; Simple problems on power transmission through pipes and efficiency of transmission;

4. Impact of jets

Derivation of formulae for the force, work done and efficiency in case of jet striking on a) Fixed vertical flat plate) Fixed inclined flat plate c) Moving flat plate d) Moving Inclined flat plate e) Series of flat plates fixed on the rim of a wheel f) At the centre and at the tip of a fixed curved blade g) at the centre and at the tip of a moving curved blade; Simple problems on the above cases;

5. Hydraulic Turbines

Introduction to hydraulic Turbines; Hydro-electric power stations; line sketch showing layout of hydro-electric power plant; Classification of turbines; Working principle of Pelton wheel, Work done and Efficiencies of Pelton wheel; Working principle of Francis turbine, and Kaplan turbine; Simple Problems on power & efficiency of Francis and Kaplan turbines;

6. Hydraulic Pumps

Classification of pumps; Principle and of operation of a reciprocating pumps (Single acting, double acting pumps); Effect of velocity and acceleration of fluids, in suction and delivery pipes (without proof); Air vessel; Expression for theoretical power required to drive the pump (without proof). Simple problems related to above. Coefficient of discharge, slip, % of slip and negative slip;

Principe and operation of centrifugal pump; Comparison between Reciprocating and Centrifugal pumps; Priming; Work done by the impeller; Static head, Manometric head; Efficiencies- Manometric efficiency, volumetric efficiency, Mechanical efficiency and Overall efficiency; Cavitation and its effect; Simple problems on work, power and efficiency;

7. Oil Power Hydraulics

Basic Components of oil Power system; Applications; Principle and working of pumps (Gear Pumps, Vane Pump and Piston Pump) used in the oil power systems; Hydraulic Actuators (Single Acting, Double Acting, Telescopic and Tandem); Direction Control Valves; Pressure Control Valves; Flow Control Valves;

8. Pneumatics

Basic Components of Pneumatic Power system; Applications (Vehicle door operation system, Pneumatic work holding devices, pneumatic braking system); Principle and working of Filter, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust valves, Pneumatic actuators, Pneumatic circuits for control of single acting cylinders and double acting cylinders. Comparison of hydraulic power systems with pneumatic power systems;

REFERENCE BOOKS

1. Fluid power with applications by Anthony Esposito - Printice Hall of India
2. Fluid power control - NPTEL Web course
3. Pneumatics by SRIHARI RAO
4. Pneumatic controls by FESTO
5. Fluid Power Pneumatics by ALAN H. JOHN
6. Pneumatics by FLIPPO
7. Pneumatics By TTI
8. Hydraulics & Pneumatics by RAY & RAO
9. Fluid Power & Pneumatics by AUDEL Series
10. Pneumatic Systems: Principles and Maintenance-S.R Majumdar
11. Oil Hydraulic Systems: Principles and Maintenance-S.R Majumdar

Thermal Engineering-II

Subject Title : Thermal Engineering-II
Subject Code : M-403
Periods/Week : 06
Periods per Semester : 90

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage of Marks	SAQ	EAQ	Unit Test Syllabus
1	Properties of steam	12	13	1	1	Unit Test - I
2	Steam Generators	12	13	1	1	
3	Thermodynamic Processes on steam	16	16	2	1	
4	Steam Nozzles	10	13	1	1	
5	Steam Turbines	16	16	2	1	Unit Test - II
6	Gas Turbines	08	13	1	1	
7	Jet Propulsion	08	13	1	1	
8	Elements of Automobile transmission	08	13	1	1	
	T O T A L	**90**	**110**	**10**	**8**	

OBJECTIVES

Upon completion of the course the student shall be able to:

1. Properties of steam

1.1. State the industrial uses of steam
1.2. Draw a T-h diagram for steam showing, saturated liquid line, saturated vapour line, liquid region, vapour region, wet region, superheat region, critical point, saturated liquid, saturated vapour
1.3. Define saturation temperature, saturated liquid, sensible heat, latent heat, wet steam, dryness fraction, wetness fraction, saturated steam, superheated steam, degree of superheat
1.4. Write expressions for specific volume, specific enthalpy, specific external work of evaporation, specific internal energy, internal latent heat, specific entropy, of wet / dry / superheated steam at a given pressure or temperature
1.5. Read steam properties from saturated steam (temperature / pressure tables)
1.6. Read steam properties from superheated steam tables
1.7. Read Mollier chart and obtain the properties of a given sample of steam
1.8. Solve problems on properties of steam using steam tables / Mollier chart

2. Steam Generators

2.1. State the industrial uses of boilers
2.2. Classify steam boilers and give practical examples to each type
2.3. Differentiate between water tube and fire tube boilers
2.4. Differentiate between high pressure and low pressure boilers
2.5. Define boiler mounting

2.6. State the functions of popular boiler mountings - pressure gauge, water level indicator, fusible plug, blow down cock, stop valve, safety valve
2.7. Define boiler accessories
2.8. State the functions of popular boiler accessories - feed pump, economiser, super heater and air pre-heater
2.9. State the features of high pressure boilers
2.10. Illustrate the working of a Lamont steam generator
2.11. State the features of supercritical boilers
2.12. Illustrate the working of a Benson boiler
2.13. Differentiate between steam traps and steam separators
2.14. Illustrate the location of steam traps and steam separators in a steam circuit
2.15. State the features of stoker boilers
2.16. State the features of FBC boilers
2.17. Define boiler draught and state its necessity
2.18. Illustrate natural, forced, induced and balanced draught systems
2.19. Compare artificial and natural draught systems
2.20. Compare induced and forced draught systems
2.21. Define Actual evaporation, Equivalent evaporation, Factor of equivalent evaporation, Boiler horse power and Boiler efficiency of boilers
2.22. Write expressions for Actual evaporation, Equivalent evaporation, Factor of equivalent evaporation, Boiler horse power and Boiler efficiency
2.23. Solve simple problems on estimation of the above boiler performance parameters from test data

3. Thermodynamic Processes on steam

3.1. Solve problems on calculation of changes in specific volume, specific enthalpy, specific internal energy, specific entropy; and calculation of external work done and heat transferred, for the following processes on wet / saturated / superheated steam
- 3.1.1. Isochoric process
- 3.1.2. Isobaric process
- 3.1.3. Hyperbolic process
- 3.1.4. Isothermal process
- 3.1.5. Isentropic process
- 3.1.6. Throttling process
- 3.1.7. Polytropic process

3.2. Represent the above processes on h-s and T-s diagrams of steam
3.3. Illustrate the experimental determination of dryness fraction of steam using separating and throttling calorimeter

4. Steam Nozzles

4.1. Differentiate between a nozzle and a diffuser
4.2. Classify nozzles
4.3. Illustrate a convergent-divergent nozzle, and explain the reason for its shape
4.4. Represent the steam flow through a convergent-divergent nozzle on Mollier chart
4.5. State the conditions under which the divergent portion acts as a nozzle
4.6. Write expression for velocity of steam at the exit of nozzle in terms of heat drop with and without friction
4.7. Solve simple problems on estimation of steam velocity at the exit of a nozzle
4.8. Define nozzle efficiency
4.9. Define critical pressure ratio and state its significance
4.10. Solve simple problems on calculation of cross section areas at throat and exit for maximum discharge through a nozzle
4.11. State the effect of friction in nozzles
4.12. Explain the concept of super saturated flow in nozzles
4.13. Illustrate the working of a steam jet injector

5. Steam Turbines

5.1. Illustrate Rankine cycle on p-V and T-s diagrams
5.2. Identify the operations of a boiler, turbine, and condenser on a Rankine cycle
5.3. Define a steam turbine
5.4. Classify steam turbines with practical examples
5.5. Compare impulse and reaction turbines
5.6. Illustrate the working principle of a De-Laval turbine
5.7. Illustrate the variation of steam pressure and velocity across a single stage impulse turbine
5.8. Draw the velocity triangles of a De-Laval turbine
5.9. Write expressions for work done, axial thrust, tangential thrust, blade efficiency, nozzle efficiency, stage efficiency of De-Laval turbine
5.10. Solve simple problems on determination of work done, axial thrust, tangential thrust, blade efficiency, nozzle efficiency, stage efficiency of De-Laval turbine
5.11. State the necessity of reducing rotor speeds of De-Laval turbine
5.12. Define compounding of turbines and name the various types of compounding
5.13. Illustrate the pressure, velocity, and pressure-velocity types of compounding
5.14. Explain the reaction principle and identify it as one of the methods of reducing rotor speeds
5.15. Illustrate the working principle of a Parson's Reaction turbine
5.16. Illustrate the variation of steam pressure and velocity across a Parson's Reaction turbine
5.17. Draw the velocity triangles of a Parson's Reaction turbine
5.18. Write expressions for work done, axial thrust, tangential thrust, diagram efficiency, stage efficiency, degree of reaction and blade height of a Parson's Reaction turbine
5.19. Solve simple problems on determination of work done, axial thrust, tangential thrust, diagram efficiency, stage efficiency, degree of reaction and blade height of a Parson's Reaction turbine
5.20. Define a condenser and state its functions in a steam power plant
5.21. Classify steam condensers
5.22. Illustrate the working of a Shell and tube condenser
5.23. State the purpose of bleeding and reheating of steam in steam turbines
5.24. State the necessity of governing steam turbines
5.25. Illustrate Throttle, By-pass and Nozzle control governing methods

6. Gas turbines

6.1. State the principle of working of a gas turbine
6.2. Compare gas turbine with steam turbine
6.3. Compare gas turbine with reciprocating IC engine
6.4. Classify gas turbines
6.5. State the applications and limitations of gas turbines
6.6. Illustrate Joule's cycle on p-V and T-s diagrams
6.7. Illustrate the working of an open cycle constant pressure gas turbine
6.8. Illustrate the working of a closed cycle constant pressure gas turbine
6.9. Compare open cycle and closed cycle gas turbines
6.10. Illustrate Atkinson's cycle on p-V and T-s diagrams
6.11. Illustrate the working of an open cycle constant volume gas turbine
6.12. Compare constant pressure and constant volume gas turbines

7. Jet Propulsion

7.1. Define jet propulsion
7.2. State the principle of jet propulsion
7.3. Name the fuels used for jet propulsion
7.4. State the applications of jet propulsion
7.5. Illustrate the working of a turbojet engine
7.6. State the principle of Ram effect
7.7. Illustrate the working of a Ram jet engine
7.8. Define rocket propulsion
7.9. State the principle of rocket propulsion
7.10. Illustrate the working principle of a rocket engine

7.11. State the applications of rocket propulsion
7.12. Compare jet and rocket propulsions

8. Elements of Automobile transmission

8.1. Illustrate the principal components of an automobile transmission system
8.2. State the functions of the principal components of an automobile transmission system
8.3. Illustrate the working of single plate clutch
8.4. Illustrate the working of a three speed sliding mesh gear box
8.5. State the necessity of an automobile differential
8.6. Illustrate the working of an automobile differential
8.7. Illustrate the rear axle assembly of an automobile

COURSE CONTENT

1. Properties of steam

1.1. Formation of steam under constant pressure –T-h diagram – saturated liquid line – saturated vapour line – liquid region – vapour region – wet region – superheat region - critical point – significance of critical point
1.2. Concepts of saturation temperature, saturated liquid, sensible heat, latent heat, wet steam, dryness fraction, wetness fraction, saturated steam, superheated steam, degree of superheat
1.3. Expressions (without proof) for specific volume, specific enthalpy, specific external work of evaporation, specific internal energy, internal latent heat, specific entropy, of wet, dry and superheated steam at a given pressure
1.4. Introduction to steam tables - using steam tables to calculate the above properties - simple problems on the above
1.5. Introduction to Mollier chart – simple problems on properties of steam applying the chart
1.6. Industrial uses of steam

2. Steam Generators

2.1. Function and use of steam boilers - classification of steam boiler with examples -comparison of water tube and fire tube boilers – comparison of high pressure and low pressure boilers
2.2. Definition for boiler mountings - need – functions of popular boiler mountings viz. pressure gauge, water level indicator, fusible plug, blow down cock, stop valve, safety valve (sketches omitted) - definition of boiler accessories - functions of popular boiler accessories viz. feed pump, economiser, super heater and air pre-heater (sketches omitted)
2.3. Features of high pressure boilers – layout of a Lamont steam generator - working principle - features of supercritical boilers –layout of Benson boiler–working principle
2.4. Need of steam traps and steam separators – functional difference between the two – layout showing their location in a steam line - recent trends in boilers – introductory treatment of stoker boilers and fluidized bed combustion (FBC) boilers
2.5. Definition of boiler draught – types–natural and artificial – types of artificial draught - layout of natural, forced, induced and balanced draught systems – comparison between artificial and natural draught systems – comparison between induced and forced draught systems
2.6. Definitions of boiler performance parameters viz. Actual evaporation, Equivalent evaporation, Factor of equivalent evaporation, Boiler horse power and Boiler efficiency - formulae for the above terms (without proof) - simple direct problems on the above

3. Thermodynamic Processes on steam

3.1. Calculation of changes in specific volume, specific enthalpy, specific internal energy, specific entropy; and calculation of external work done and heat transferred, for the following processes on wet / saturated / superheated steam, with representation on h-s and T-s diagrams:
3.1.1. Isochoric process
3.1.2. Isobaric process
3.1.3. Hyperbolic process

3.1.4. Isothermal process
3.1.5. Isentropic process
3.1.6. Throttling process
3.1.7. Polytropic process

3.2. layout of separating and throttling calorimeter - experimental determination of dryness fraction of steam using the calorimeter(problems omitted)

4. Steam Nozzles

4.1. Definitions of nozzle and diffuser - types of nozzles – construction of a convergent-divergent nozzle – reasons for its shape - representation of steam flow through it on a Mollier chart – conditions under which the divergent portion acts as a nozzle/diffuser

4.2. Expression for velocity of steam at the exit of nozzle in terms of heat drop with and without friction (derivation omitted) – simple problems applying the expression – definition of nozzle efficiency

4.3. Concept of critical pressure ratio (CPR)in a nozzle – its significance - expression for CPR (derivation omitted) - calculation of cross section areas at throat and exit for maximum discharge – simple problems (frictionless cases only)

4.4. Effect of friction in nozzles - super saturated flow in nozzles – choking of nozzles

4.5. Layout of a steam jet injector – working principle – applications

5. Steam Turbines

5.1. Rankin cycle – p-V and T-s diagrams of the cycle – operations of boiler, turbine and condenser on the cycle - definition of steam turbine - classification of steam turbines with examples – comparison of impulse and reaction turbines.

5.2. Layout of a De-Laval turbine –working principle– graphs showing variation of pressure and velocity across the turbine – velocity triangles for the turbine

5.3. Expressions (without proof) for work done, axial thrust, tangential thrust, blade efficiency, nozzle efficiency,stage efficiency of De-Laval turbine – simple problems (without blade friction cases only) using analytical and graphical methods

5.4. Need for reducing rotor speeds of De-Laval turbine– definition of compounding – methods of compounding - velocity compounding, pressure compounding, compounding for both pressure and velocity (graphical representations only)

5.5. Reaction principle - layout of a Parson's Reaction turbine – working principle - graphs showing variation of pressure and velocity across the turbine – velocity triangles for the turbine

5.6. Expressions (without proof) for work done, axial thrust, tangential thrust, diagram efficiency, stage efficiency, degree of reaction, blade height of a Parson's reaction turbine – simple problems (without blade friction cases only) using analytical and graphical methods

5.7. Definition of a condenser – its necessity in steam power plants – classification of condensers – layout of a shell and tube condenser – working principle - concept of Bleeding and Reheating of steam in steam turbines (Problems omitted)

5.8. Governing of steam turbines – necessity – types – layout of Throttle, By-pass and Nozzle control governing methods – applications of these methods

6. Gas turbines

6.1. Principle of a gas turbine – comparison of steam turbines and gas turbines – comparison of gas turbines and a reciprocating IC engines– classification of gas turbines - applications and limitations of gas turbines

6.2. Joule's cycle – its p-V and T-s diagrams –its application to open cycle constant pressure gas turbine – layout of the turbine - working principle

6.3. Application of Joule's cycle to closed cycle gas turbine – layout of the turbine – working principle – comparison between open cycle and closed cycle gas turbines

6.4. Atkinson cycle – its p-V and T-s diagrams –its application to open cycle constant volume gas turbine – layout of the turbine - working principle – comparison between constant pressure and constant volume gas turbines

7. Jet Propulsion

7.1. Definition of Jet propulsion – principle – fuels used - applications
7.2. Layout of a turbojet engine - principle of operation – applications
7.3. Principle of Ram effect – layout of a Ram jet engine - principle of operation – applications
7.4. Definition of Rocket propulsion – fuels used in rocket propulsion- comparison with jet propulsion – layout of a Rocket engine – principle of operation – applications

8. Elements of Automobile transmission

8.1. Layout of automobile transmission system – functions of principal components
8.2. Clutch – its functions - layout of a plate clutch (single plate) – working principle – materials used for its principal components
8.3. Gear box – its functions - layout of a sliding mesh (three speed) gear box – working principle – materials used for its principal components
8.4. Differential – its necessity – layout – working principle – layout of rear axle assembly

Sno	Title of the Book	Author	Publisher
1	Elements of Heat Engines, Vol-I, II, III	R.C. Patel and C.J. Karamchandani	Acharaya Publications
2	Thermal Engineering	R.S.Khurmi	S.Chand
3	Automobile Engineering	Kirpal Singh	Standard Publishers Distributors Delhi

Production Technology-II

Subject title : Production Technology-II
Subject code : M- 404
Periods per week : 06
Periods per semester : :90

TIME SCHEDULE

SNo.	Major Topics	No. of,Periods	Weightage	SAQ	EAQ	Unit test Bifurcation
1	Milling	14	16	02	01	Unit Test- I
2	Gear Making	12	13	01	01	
3	Grinding and finishing processes	15	16	02	01	
4	Modern Machining Process	09	13	01	01	Unit Test-II
5	Plastic processing	12	13	01	01	
6	Press Tools,	10	13	01	01	
7	Jigs and Fixtures	10	13	01	01	
8	Jig Boring	08	13	01	01	
Total		**90**	**110**	**10**	**08**	

OBJECTIVES

On the completion of the course the student should be able to

1. **Milling**
   - 1.1. Explain the principle of working of a Milling machine.
   - 1.2. Classify the milling machines.
   - 1.3. Illustrate the constructional details
   - 1.4. Explain the functions of each part of the machine.
   - 1.5. Describe the various milling operations.
   - 1.6. Identify the different milling cutters.
   - 1.7 Explain the different indexing methods
   - 1.8 Explain the specifications of milling machines.

2. **Gear Making**
   - 2.1. Identify the different methods of producing gears.
   - 2.2. Illustrate gear shaping
   - 2.3. Sketch the gear hob.
   - 2.4. Identify the various components of hobbing machine
   - 2.5. Describe the working of the above machine .
   - 2.6. List out the sequence of operations in generating gear by gear hobbing machine
   - 2.7. Explain the different methods of finishing & checking gear teeth dimensions
   - 2.8. Specify the gears
   - 2.9. Identify the gear materials
   - 2.10. State the different heat treatment processes applied to gears

3. **Grinding and finishing Processes**
   - 3.1. Explain the principle of metal removal by grinding
   - 3.2. Identify different abrasives.
   - 3.3. Explain the bonds and grinding wheel manufacturing processes
   - 3.4. Identify the grinding wheel from the standard code (Marking system or designation of wheel)

3.5. State the factors for selecting the grinding wheel
3.6. State the methods of grinding
3.7. Classify the grinding machines
3.8. Illustrate the cylindrical, surface, tool and cutter grinders
3.9. State different finishing processes by grinding.(Honing ,Lapping, Superfinishing)
3.10. Illustrate the principle of electro–plating
3.11. Explain the principle of hot dipping processes namely, Galvanising, tin coating, Parkerizing and anodising
3.12. Describe organic coatings
3.13. State the principles of metal spraying
3.14. State the features of wire process and powder process
3.15. Select the appropriate process for surface roughness a given application.

4. **Modern Machining Processes**
4.1. Distinguish between non-conventional machining processes and traditional machining
4.2. State their relative advantages
4.3. Illustrate principle of working of Ultrasonic Machining
4.4. Identify the equipment used in U.S.M. processes
4.5. Illustrate the principle of electric discharge machining (EDM)
4.6. Illustrate Abrasive jet machining
4.7. Illustrate Laser beam machining
4.8. State the principle of chemical machining
4.9. State their advantages, disadvantages and applications

5. **Plastic Processing**
5.1. Indicate the principle of manufacturing plastic products
5.2. Illustrate the methods of moulding methods-injection compression ,transfer moulding
5.3. Explain the principle of extruding, casting and calendering
5.4. Identify the different fabrication methods viz., sheet, Forming, blow moulding, laminating and reinforcing of plastics
5.5. Indicate the principle of machining and welding plastics
5.6. Know Engineering applications of plastics

6. **Press Tools**
6.1. Explain Importance of Press Tools
6.2. Classify presses- based on power and design of frame
6.3. Illustrate the constructional details of a power press
6.4. State the meaning of Press size.
6.5. Explain Press Tools – Punch and die
6.6. Explain Die-clearance- Die Accessories
6.7. Understand shear action in die cutting operation – Punc and die clearances, Angular clearance, centre of pressure, cutting forces
6.8. Explain different types of dies
6.9. Understand various die operations

7. **Jigs and Fixtures**
7.1. Know the function of Jigs and Fixtures
7.2. State the advantages of Jigs and Fixtures
7.3. Differentiate jigs and fixtures

7.4. List various types of jigs and their constructional details
7.5. State general considerations in design of drill jigs
7.6. State the function of drill bush
7.7. Identify different types of fixtures and their constructional details
7.8. Explain basic principle of location
7.9. Identify different locating methods and devices
7.10. Understand basic principle of clamping
7.11. Identify different types of clamps and their constructional details with legible sketches

8. **Jig Boring**
   8.1. Know the situation where jig-boring machines are needed
   8.2. Illustrate the principle of working of a jig boring machine
   8.3. Classify the jig boring machines
   8.4. Illustrate the constructional details of open front machine and cross rail type machine
   8.5. Explain the function of above machines
   8.6. Describe the systems of location of holes

COURSE CONTENTS

1. **Milling**
   1.1. Introduction
   1.2. Types of milling machines: plain, Universal, vertical, constructional details – specifications
   1.3. Milling operations
   1.4. Indexing - simple, compound and differential indexing
   1.5. Milling cutters – types – nomenclature of teeth – teeth materials
   1.6. Tool Signature of Milling cutter

2. **Gear making**
   2.1. Manufacture of gears – by casting, moulding – stamping - coining – extruding- rolling – Machining
   2.2. Gear generating methods: Gear Shaping with pinion cutter & rack cutter, Gear hobbing
   2.3. Description of gear hob – Operation of gear hobbing machine
   2.4. Gear finishing processes
   2.5. Gear materials and specification
   2.6. Heat treatment processes applied to gears

3. **Grinding and finishing processes**
   3.1. Introduction – principles of metal removal by Grinding.
   3.2. Abrasives – Natural & Artificial
   3.3. Bonds and binding processes: Vitrified, silicate, shellac, rubber, bakelite
   3.4. Factors effecting the selection of grind wheels – size and shape of wheel – kind of abrasive – grain size – grade and strength of bond – structure of grain – spacing – kinds of bind material
   3.5. Standard marking systems: Meaning of letters & numbers sequence of marking – Grades of letters.
   3.6. Grinding machines – classification: Cylindrical, Surface, Tool & Cutter grinding machine- construction details – relative merits
   3.7. Principle of centreless grinding
   3.8. Advantages & limitations of centre less grinding
   3.9. Finishing by grinding: Honing, Lapping, Super finishing

3.10. Electroplating – Basic principles – Plating metals – applications
3.11. Hot dipping: Galvanizing, Tin coating, Parkerising, Anodizing.
3.12. Metal spraying: wire process, powder process and applications
3.13. Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating
3.14. Finishing specifications.

4. **Modern Machining Processes**
   4.1. Introduction – comparison with traditional machining
   4.2. Ultrasonic machining - principle – Description of equipment – applications
   4.3. Electric Discharge Machining: Principle – Description of equipment – applications
   4.4. Abrasive jet machining – principle – description of equipment – application
   4.5. Laser beam machining - principle – description of equipment – application
   4.6. Chemical machining- description of equipment- application

5. **Plastics Processing**
   5.1. Processing of plastics
   5.2. Moulding processes-Injection moulding, Compression moulding, Transfer moulding,
   5.3. Extruding,
   5.4. Casting
   5.5. Calendering
   5.6. Fabrication methods-Sheet forming, Blow moulding, Laminating plastics (sheets, rods & tubes),Reinforcing
   5.7. Applications of Plastics

6. **Press Tools**
6.1. Introduction
6.2. Types of Presses–hand, power, gap, inclinable, adjustable, horn, straight side, pillar presses.
6.3. Constructional details of a power press., Press size
6.4. Press Tools – Punch and die,
6.5. Die Accessories – Stops, Pilots, strippers, Knock outs, pressure pads
6.6. Shear action in die cutting operation – punch and die clearance and angular clearance, centre of pressure, cutting forces
6.7. Press working operations: blanking, piercing and forming, lancing, cutting off and parting, notching, shaving, trimming, embossing, beading and curling, bulging, twisting, coining, swaging, hole flanging or extruding – line sketches and meaning of terms
6.8. Sheet metal bending: bending methods, spring back, bend allowance, bending pressure – sketches and empirical formulae
6.9. Types of dies meaning of inverted, progressive, compound and combination dies
6.10. Material selection for punch and die.

7. **Jigs Fixtures**
7.1. Definition of jig
7.2. Types of jigs-leaf jig, box and handle jig, template jig, plate jig, Indexing jig, Universal jig, vice jigs - Explain the constructional details of the above jigs.
7.3. General consideration in the design of drill jigs
7.4. Explain drill bush
7.5. Types of fixtures- vice fixtures, milling fixtures, boring fixtures, grinding fixtures.
7.6. Explain the constructional details of the above fixtures.

7.7. Basic principles of location
7.8. Explain the locating methods and devices
7.9. Explain the basic principles of the clamping.
7.10. Types of clamps- strap clamps, cam clamps, screw clamps, toggle clamps, hydraulic and pneumatic clamps

8. **Jig Boring.** Introduction.- Jig boring on vertical milling machine. Types jig boring machines-Open front machine. Cross rail type machine constructional details & their working -System of location of holes

REFERENCE BOOKS

1. Production Technology - R.C.Patel,
2. Production Technology - Jain & Gupta.,
3. Gear Technology - Charrathi,
4. A Text Book of Production Engg - Dora,
5. Tool Design - Donaldson
6. Manufacturing technology - Hajra Chowdary Vol I & II

Design of Machine Elements

Subject Title : Design of Machine Elements
Subject Code : M – 405
Periods/Week : 06
Periods/Semester : 90

TIME SCHEDULE

S. No	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions	Unit test syllabus
1	Introduction	04	03	01	-	Unit Test - I
2	Bolts, Nuts & Screws	12	13	01	01	
3	Shafts, Keys and Couplings	16	23	01	02	
4	Belts & chains	12	16	02	01	
5	Gears	12	13	01	01	Unit Test - II
6	Bearings	12	13	01	01	
7	Cams	10	13	01	01	
8	Fly wheels & Governors	12	16	02	01	
Total		**90**	**110**	**10**	**08**	

OBJECTIVES

Up on completion of the course the student shall able to comprehend

1. Introduction

1.0 To understand the basic requirements of design.
1.1 To define the term design.
1.2 To identify the factors governing design.
1.3 To state general design procedure.

2. Bolted Joints

2.1 Explain screw thread nomenclature and specifications of screw threads
2.2 To know the strength of screwed fasteners
2.3 To know the stresses in bolts
2.4 Design the size of bolt for a given load requirement.
2.5 Design the size of eye bolt for a given load requirement
2.6 To draw an eye bolt (not to scale) showing the proportions

3. Shafts, Keys and Couplings

3.1 State the functions and types of shafts.
3.2 Design solid and hollow shafts to transmit a given power a given RPM based on strength and rigidity.
3.3 Design an axle.
3.4 Design using Rankine's and Guest's theory.
3.4 Know standard sizes of shafts as per I.S.
3.5 Explain the function of keys and splines.
3.6 Name the recommended materials used for keys and splines.
3.7 Explain the possible ways of failure of a key under load.
3.8 Design and sketch a rectangular sunk key considering failure against shear and crushing for a given torque and also using empirical relations.
3.9 Write all the proportions of a spline for a given application referring tables.

3.10 Know the specifications of parallel, gib-head and taper sunk keys as per B.I.S.
3.11 Explain the function of a coupling.
3.12 Types of couplings
3.13 Design a cast iron flange-coupling (rigid type) for a given torque.

4. Understand the Design of Belts and chain drives

4.1 Explain the selection criteria of various means of power transmission.
4.2 Identify various types of belts.
4.3 Identify different types of drives in belts.
4.4 Design a stepped pulley for a belt drive.
4.5 Compute power transmitted.
4.6 Design belt dimensions for a given power transmission.
4.7 Apply the effect of centrifugal tension in the above cases.
4.8 List the Components of chain drives
4.9 State advantages of chain drives.
4.10 List the types of chains (Design of chain drives omitted)

5. Understand the Design of Gear drives

5.1 Explain the nomenclature of spur gear tooth.
5.2 Identify various tooth profiles of gear.
5.3 Gear tooth design using Lewis equation for static loading only
5.4 List different types of gear trains
5.5 Design different types of gear trains for given velocity ratios
5.6 Explain the applications of gear trains

6. Bearings

6.1 State the function of bearings
6.2 classify the bearings
6.3 Advantages and disadvantages of sliding contact bearings
6.4 select a bearing for given loads using tables
6.5 Design a simple journal bearing using McKee's equation
6.6 Calculate heat generated and dissipated in journal bearing
6.7 Calculate heat generated and dissipated in collar bearing based on uniform pressure and uniform wear
6.8 State advantages and disadvantages of anti-friction bearings (design omitted)
6.9 Illustrate a ball / roller bearing
6.10 Specify a bearing

7. Understand the Design of Cams.

7.1 Explain the features of cam profile.
7.2 Classify the cams.
7.3 Define terms related to cam profile.
7.4 Draw angular - displacement diagram for lift motion for:
  a) Uniform velocity.
  b) S.H.M.
  c) Uniform acceleration & retardation.
7.5 Draw simple cam profiles in above three cases for knife edge and roller followers. (offset followers are omitted)

8. Understand the Design of Fly wheels and Governors

8.1 State the function of flywheel
8.2 Explain the terms related to flywheel
8.3 State the formula for energy stored by flywheel
8.4 Solve simple problems and design of fly wheel
8.5 Explain the function of governor using legible sketch.

8.6 Description of working principle of Watt governor and Porter governor using legible sketch
8.7 Explain the terms – sensitiveness, stability, isochronism, hunting, effort and power of governor (design of governors omitted)

COURSE CONTENT

1. Introduction

Factors governing the design of machine element - nature of load, working stress, mechanical properties of the material of the product, process of manufacture, reliability, durability, Cost, life of product and safety.
General sequence of steps in designing a machine element.

2. Bolted Joints

Revision of nomenclature, form of threads – specifications.
Strength of screwed fasteners and failure of bolts due to different reasons
stresses due to inital tightening and stresses due to external forces
stress due to combination of forces – Stresses due to shear loads application.
Design of Nut – Hexagonal and square shapes only.
Design of eye bolt for a given load and sketching - using empirical proportions, applications of eye-bolt.

3. Shafts, Keys and Couplings

shafts

Function of shafts and materials used for shafts
Standard sizes of shafts as per I.S.
Design of diameters for solid and hollow shafts to transmit a given power at given rpm.,
a) based on strength
b) based on rigidity.
Design of axle.
Design of shaft/axle/spindle on the basis of Rankine's and Guest's theory (simple problems 0nly)
Numerical problems

keys

Function of keys and splines specification of splines.
Materials of keys and splines.
Discussion over nature of failure of key-effect of key way and the shaft strength.
Design of a rectangular sunk key considering its failure against shear and crushing – given the power transmitted by the shaft and rpm.
Design of rectangular sunk key using empirical proportions for given diameter of the shaft. Check for strength.
Proportions of a spline for a given application using tables.

Couplings : Function of coupling.
Types of couplings.
Rigid flange coupling : Calculation of dimensions for a C.I. flange coupling and coupling bolts for a given torque using empirical proportions – Sketching the flange coupling with the computed dimensions.
Numerical problems and sketching.

4. Belts and chain drives

Factors to be considered while selecting the type of drive
Belt drive, types of belt drives; belt materials, belt joints
length of open and crossed belts (without proof).
Design of stepped pulley belt drive only.
Expression for the ratio of belt tensions (without proof).

Concept of centrifugal tension – Relation between centrifugal tension and the tension on tight side for transmitting maximum power (derivation omitted).
Permissible stress in the belt per unit width : per unit cross section.
Calculation of belt thickness and width for given permissible stress for open and crossed belts, considering centrifugal tension and without considering centrifugal tension. – simple problems
Chain drives –advantages-Types of chains – Roller and silent chains.
(Design of chains omitted)

5. Gear drives

Gear tooth terminology – involute and cycloidal profiles
Gear tooth design using Lewis equation for static loading only.
Simple, compound, reverted & Epi cyclic gear trains.
Design of number of teeth for simple, compound and reverted gear trains for a given speed ratio and sketching the arrangement.
Applications of gear trains –
Problems on back gear assembly of lathe – 3- Speed gear box of an automobile.
Description and application of epi-cyclic gear trains (epicyclic gear trains design omitted)

6. Bearings

Functions, Types of bearings
Journal bearing – terminology, McKee's Equation, Bearing Modulus
Friction in journal bearing, Friction circle, power lost due to friction in bearings, design of
Thrust bearing - Power lost in friction, flat pivot and flat collar under conditions of uniform intensity of pressure and wear
Rolling contact bearings – advantages and disadvantages (design of anti friction bearings omitted)
Components of rolling contact bearing
Market or commercial specifications of ball and roller bearings as per BIS standards

7. Cams

Classification of cams and followers – uses.
Working principle of plate and cylindrical cams.
Nomenclature of radial cam.
Explanations of terms cam profile, base-circle, cam angles, trace point.
Motion of follower – Uniform velocity, uniform acceleration and retardation and simple harmonic motion – Time Vs. displacement diagram only.
Construction of cam profile of a plate cam with knife edge & roller follower for all three types of motions stated above.
Problems on drawing of cam profiles as stated above for the follower axis passes through the axis of the cam shaft (offset followers not included)

8. Fly wheels and Governors

Purpose and applications of fly wheels – Definitions of Coefficient of fluctuation of speed and Coefficient of fluctuation of energy.
Turning moment diagram of flywheels
Formula for energy stored by fly wheel (without proof) – simple problems on design of flywheel
Governor – function – types
Explanation of Simple Watt governor and Porter governor
Define the terms like Sensitiveness, Stability, Isochronism, Hunting, Effort and Power of governor (design of governors omitted)

REFERENCES

1. Machine Design - R.S.Khurmi., S Chand &Company
2. Design of Machine Elements - Pandya and Shah, Charotar Publishing House.
3 Design of Machine Elements – V B Bhandari , Tata McGraw Hill.
4 Machine Design – R.K. Jain, Khanna Publications

Production Drawing

Subject Title : Production Drawing
Subject Code : M-406
Period/Week : 03
Period per Semester : 45

TIME SCHEDULE

S.No	Major Topics	Number of Periods	Weightage of *Marks*		Part-A Questions	Part-B Questions
			Part-A	Part-B (each question)		
1	Introduction to Production Drawing	03	-	-	-	-
2	Limits, Fits & Dimensional Tolerances	06	05	05	01	02*
	Geometrical Tolerances	03	05	03	01	
3	Surface finish	03	05	03	01	
4	Specification of materials & standard components	03	05	04	01	
5	Process sheet	03	-	05	-	
6	Exercises in Production Drawing	24	-	20 (component drawing)		
	Total	45	20	40	04	02

***NOTE :**

1. **Candidate has to answer all questions in part- A and one question from Part- B.**
2. **Part B question carries 40 marks and distributed for views, process Sheet, selection of materials, surface finish, limits fits and tolerances.**
3. **Part drawing for maximum two components is to be given under Part-B**

OBJECTIVES

Up on the completion of the course the student shall be able to

1. Understand the need of production drawing.

1.1 Distinguish the machine drawing from a production drawing.
1.2 State the factors that govern the preparation of a production drawing.
1.3 Identify the components of a production drawing.
1.4 List the function of the component.
1.5 Prepare the relevant views of the part and dimension the part.
1.6 Indicate the details of specific processes like, heat treatment, welding, counter boring etc.

2. Interpret dimension to obtain a fit as per BIS standards.

2.1 State definition of fit, allowance and tolerance.
2.2 Select dimension from standards to give different type of fit for the given mating parts.
2.3 Compute the fit from tables.
2.4 Indicate fits on the drawings
2.5 Importance of geometrical tolerances & Indicating geometrical tolerances on the drawing

3. Identify the standard symbol and indication added to it, to represent surface finish.

3.1 Indicate the roughness grade number and corresponding symbol as per BIS.
3.2 Indicate surface roughness on drawings.

4. Interpret and estimate the material requirement.

4.1 Identify the material of various components.
4.2 Specify the raw material as per commercial/BIS Standards.
4.3 Identify the standard part that can be procured directly from the market and specify the part as per commercial/BIS Standards for procurement.

5. Write the process sheet of production and prepare the number of production drawings.

5.1 Indicate the sequence of process of production.
5.2 Specify the relevant tools to obtain the accuracy and finish.
5.3 Indicate the suitable equipment.
5.4 Specify the type of measuring instruments to be used to check the prescribed accuracy.

6. Production Drawing Exercises

6.1 Prepare exercises on production drawing as mentioned in the contents.

COURSE CONTENT

1. Introduction and Drawing of component.

Need of preparing a production drawing, requirements for manufacturing a product like equipment, tools, measuring instruments depending upon processes, accuracy and finish data available in machine drawing – components of a production drawing, fits and tolerances, surface finish, specific processes, material of the component.
Read a given assembly drawing – study of the functions of the various parts of the assembly drawing.
Preparation of detailed drawing of a specified part of the assembly.

2. Limits, fits and tolerances.

Definitions of limits, fits and tolerances.
Select dimensions from BIS standards to obtain clearance, transition and interference fits for a given set to mating parts – computation of fit and tolerance from BIS table.
Preparation of drawing of mating parts and representation of fits and dimensional tolerances.
Representation of geometrical tolerances.
Exercises in computing tolerance and representation on the drawings for different types of fits.

3. Surface finish.

Standard symbol of surface finish and indications added to it.
Representation of quality of surface finish on the drawing as BIS roughness grade numbers.

4. Specifications of materials & standard components

Materials of the parts of the assembly – size of part, estimation of raw material required for a component and specification.
Standard components (parts) like bolts, nuts, bearings etc. – specification of standard parts.

5. Process sheet

Sequence of processes of production for a particular product.
Specifications of relevant equipment and tools to obtain the desired accuracy and surface finish.
Selection of measuring instruments to check the accuracy.

6. Exercises in Production Drawing

In order to develop the abilities required in the preparation of production drawing in the student, the use of actual production drawing from the local industries as exercises to the students is of vital importance.

Flange Coupling	**Universal Coupling**	**Eccentric**
Clapper Block	**Connecting rod**	**Drill jig**

Lathe tail stock	**Revolving Centre**	**Knuckle Joint**
Plummer Block	**Lathe Tool post**	**Non Return valve**
Foot Step bearing	**Stuffing box**	

Prepare the relevant views of the part(s) of a given assembly drawing needed for the purpose of production.

Dimension and indicate on it with relevant notes the specific processes.

Compute the fit from ISI tables as per the function of the component and indicate the limits at appropriate place on the drawing prepared.

Mark the surface finish symbols with indications added.

Prepare the process sheet indicating sequence of processes and equipment, tools, measuring instruments required.

REFERENCE BOOKS

1. IS 696 – 1972-Code of Practice for General Engg. Drawing & B.I.S Code – SP . 46. IS 696 – 1988- IS Code on fits and tolerances.
2. Machine drawing by R.B. Gupta.
3. Machine Drawing by Siddeswar.
4. Production Drawing by K.Venkat Reddy
5. Machine Drawing by Nagpal

Hydraulics & Fluid Power Control Systems Lab

Subject Title	**:**	**Hydraulics & Fluid Power Control Systems Lab**
Subject Code	**:**	**M-407**
Periods/Week	**:**	**03**
Periods per Semester	**:**	**45**

TIME SCHEDULE

S.No	Experiment Title	No. of periods
1	Venturimeter	03
2	Pipe fricion	03
3	Pelton wheel	03
4	Kaplan turbine	03
5	Francis turbine	03
6	Reciprocating pump	03
7	Centrifugal pump	03
8	Familiarisation with oil power hydraulic controls	12
9	Familiarisation with pneumatic power controls	12
	Total	45

OBJECTIVES

Upon Completion of the Lab the student shall be able to

1.0 Practice the determination of C_d of Venturimeter

1.1 State the practical applications of venturimeter.

1.2 Record the manometric head readings from U-tube manometer

1.3 Record the time taken for collecting discharge by varying the discharge

1.4 Calculate the areas of the pipe and throat of the given venturimeter

1.5 Calculate coefficient of discharge of venturimeter.

2.0 Practice the determination of loss of head in a given pipe

2.1 Measure the length of the given pipe

2.2 Record the manometric head readings from U-tube manometer

2.3 Record the time taken for collecting discharge by varying the discharge

2.4 Calculate the loss of head through the pipe

2.5 Calculate the friction factor

3.0 Practice the determination of Power and Efficiency of Pelton Wheel

3.1 Identify the components of Pelton wheel

3.2 Start turbine by switching on jet of water slowly

3.3 Apply load steadily

3.4 Record load, speed

3.5 Calculate power and efficiency of turbine

4.0 Practice the determination of Power and Efficiency of Kaplan Turbine

4.1 Identify the components of Kaplan Turbine

4.2 Start turbine by giving input water supply
4.3 Apply load steadily
4.4 Record load, speed
4.5 Calculate power and efficiency of turbine

5.0 Practice the determination of Power and Efficiency of Francis Turbine

5.1 Identify the components of Francis Turbine
5.2 Start turbine by switching on jet of water slowly
5.3 Apply load steadily
5.4 Record load, speed
5.5 Calculate power and efficiency of turbine

6.0 Practice the determination of output Power and Efficiency of Reciprocating Pump

6.1 Identify the components of reciprocating pump
6.2 Record the suction and delivery pressures from pressure gauges
6.3 Record the time taken for collecting the discharge
6.4 Record the energy meter readings and calculate input power
6.5 Calculate the output power
6.6 Calculate the efficiency

7.0 Practice the determination of output Power and Efficiency of Centrifugal Pump

7.1 Identify the components of centrifugal pump
7.2 Record the suction and delivery pressures from pressure gauges
7.3 Record the time taken for collecting the discharge
7.4 Record the energy meter readings and calculate input power
7.5 Calculate the output power
7.6 Calculate the efficiency

8.0 Familiarisation with oil power hydraulic controls

8.1 Identify the principal components of oil power hydraulic power circuits
8.2 Understand the principle of working of hydraulic actuator
8.3 Understand the principle of working of hydraulic motor.
8.4 Understand the principle of working of direction control valve
8.5 Understand the principle of working of flow control valve
8.6Understand the principle of working of pressure control valve

9.0 Familiarisation with pneumatic power controls

8.1 Identify the principal components of pneumatic power circuits
8.2 Understand the principle of working of pneumatic actuator
8.3 Understand the principle of working of pneumatic motor.
8.4 Understand the principle of working of direction control valve
8.5 Understand the principle of working of flow control valve
8.6 Understand the principle of working of pressure control valve

COURSE CONTENT

1. Determination of Coefficient of discharge of Venturimeter.
2. Determination of major losses in pipes due to friction.
3. Determination of B.P. and efficiency of Pelton wheel.
4. Determination of B.P. and efficiency of Kaplan turbine.
5. Determination of B.P. and efficiency of Francis turbine.
6. Determination of I.P. and overall efficiency of a reciprocating pump
7. Determination of I.P. and efficiency of the Centrifugal pump
8. Hands on experience on oil power hydraulic trainer
9. Hands on experience on pneumatic power trainer

Communication skills

Subject title : Communication skills
Subject code : M-408
Periods per week : 3
Periods per semester : 45

Introduction :
In the context of globalization , competence in speaking skills is the need of the hour The gap between the needs of the industry and the curriculum can be bridged by enabling the students to hone their speaking and listening skills. This course aims at providing opportunities for practicing speaking.

Time Schedule

Sno.	Topic	Periods	Weightage of marks (End Exam)	Sessional marks	Total
1	Listening I	3	10	10	20
2	Listening II	3			
3	Introducing oneself	3	50	30	80
4	Describing objects	3			
5	Describing events	3			
6	Reporting past incidents	3			
7	Speaking from observation / reading	3			
8	JAM	6			
9	Group discussion	6			
10	Mock interviews	6			
11	Making presentations	6			
		45	60	40	100

Objectives :
On completion of the course the students will be able to

- Strengthen their listening skills
- Strengthen their speaking skills

Competencies and key competencies to be achieved by the student

Topic	**Teacher's input/ methodology**	**Students competence**
Listening I Listening II	Pre- Listening –eliciting, pictures While - Listening Post –Listening –project , writing	Identifying the main idea, Identifying specific details, Identifying parallel and contradictory ideas Drawing inferences, Reasoning
Introducing oneself	Kinds of introduction --official/ personal, dynamic vocabulary, Body language, Model introduction, Use of line ups	Use of simple present tense, Sequencing, Appropriate vocabulary

Reporting incidents	Group work /pair work, Elicit, Use of past tense, Student presentations	Use of past tense, Relevant vocabulary
Describing objects	Vocabulary , Use of adjectives, Games—I spy, Group presentations	Use of adjectives, Dimensions,shapes Compare and contrast, Sequence
Describing events	Group work/pair work Use of appropriate tense	Use of appropriate tense, Sequencing

Reporting past incidents	Use of past tense, Vocabulary Student presentations	Use of past tense , sequencing
Speaking from observation/reading	Group work/pair work, Reading techniques ,	Use of past tense, Summarising , evaluating, comprehension
JAM	Effective techniques , Good beginning , conclusion, tips, Use of line ups	Vocabulary, Sequencing, Fluency, Thinking spontaneously
Group discussion	Expressing opinion, body language,	Expressing opinion, agree/ disagree, fluency,Persuasive and leadership skills
Mock interview	FAQs , body language	Role play, body language,
Making presentations	Student presentations	Using charts , pictures, interpreting data, sequencing,PPTs

Communicative methodology (CLT) should be used to create an interactive class. Apart from the suggestions given teachers are free to innovate to use any activity to improve the language competence of students . Attention can also be given to improve the accent and intonation of students.

Note:

* This subject is a theory subject.

** The workload should be calculated as theory workload.

***Examinations in the subject will be treated as a practical one.

Thermal Engineering Lab

Subject Title : Thermal Engineering Lab
Subject Code : M – 409
Periods per Week : 03
Periods per Semester : 45

TIME SCHEDULE

Sno	Name	Number of Periods
1	Study of valve timing diagrams for four stroke engines	03
2	Study of port timing diagrams for two stroke engines	03
3	Performance test on a diesel engine	06
4	Performance test on a petrol engine	06
5	Heat balance sheet on a diesel engine	06
6	Economic speed test on a petrol engine	06
7	Morse test on multicylinder engine	06
8	Volumetric efficiency of air compressor	06
9	Servicing & Maintenance of an automobile engine	03
	T O T A L	**45**

OBJECTIVES

Upon completion of the course the student shall be able to:

1. Study of valve timing diagrams for four stroke engines

1.1. Identify the inlet and outlet valves of a four stroke IC engine
1.2. Illustrate the mechanism used for valve operation
1.3. Draw a hypothetical VTD for four stroke IC engines
1.4. Draw a practical VTD for four stroke diesel engines
1.5. Draw a practical VTD for four stroke petrol engines
1.6. State the effect of valve timing on performance of the engine

2. Study of port timing diagrams for two stroke engines

2.1. Identify the ports of a two stroke IC engine
2.2. Draw a hypothetical PTD for two stroke IC engines
2.3. Draw a practical PTD for two stroke diesel engines
2.4. Draw a practical PTD for two stroke petrol engines
2.5. State the effect of port timing on performance of the engine

3. Performance test on a diesel engine

3.1. State the scope of performance test on an engine
3.2. Identify the various components of the test rig
3.3. Draw the experimental layout of the test
3.4. List out the tools and equipment required for conducting the test
3.5. State the observations to be made
3.6. Calculate the performance parameters – Indicated power, Brake power, Friction power, Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency, specific fuel consumption etc.,
3.7. Draw the performance curves
3.8. Compare with the ideal performance curves and comment on the performance of the engine

4. Performance test on a petrol engine

4.1. State the significance of performance test
4.2. Identify the various components of the test rig
4.3. Draw the experimental layout of the test
4.4. List out the tools and equipment required for conducting the test
4.5. State the observations to be made
4.6. Calculate the performance parameters – Indicated power, Brake power, Friction power, Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency, specific fuel consumption etc.,
4.7. Draw the performance curves
4.8. Compare with the ideal performance curves and comment on the performance of the engine

5. Heat balance sheet on a diesel engine

5.1. State the scope of the Heat balance test on the engine
5.2. State the significance of the test
5.3. Identify the various components of the test rig
5.4. Draw the experimental layout of the test
5.5. List out the tools and equipment required for conducting the test
5.6. State the observations to be made
5.7. Calculate the heat equivalent of brake power, cooling water loses, flue gas loses, radiation loses etc.,
5.8. Draw a heat balance sheet for the engine
5.9. Compare it with that of an ideal engine and comment on the performance of the engine

6. Economic speed test on a petrol engine

6.1. State the significance of the test
6.2. Identify the various components of the test rig
6.3. Draw the experimental layout of the test
6.4. List out the tools and equipment required for conducting the test
6.5. State the observations to be made
6.6. Estimate the range of economic speed for the engine

7. Morse test on multicylinder engine

7.1. State the scope of the test
7.2. Identify various components of the test rig
7.3. Draw the experimental layout of the test
7.4. List out the tools and equipment required for conducting the test
7.5. State the observations to be made
7.6. Calculate the Brake power, Indicated power, Friction power, and Mechanical efficiency of the engine

8. Volumetric efficiency of air compressor

8.1. State the scope of the test
8.2. State the significance of the test
8.3. Identify various components of the test rig
8.4. Draw the experimental layout of the test
8.5. List out the tools and equipment required for conducting the test
8.6. State the observations to be made
8.7. Calculate the volumetric efficiency of the compressor
8.8. Compare the value with that of an ideal compressor, and comment on the performance of the compressor

9. Servicing & Maintenance of an automobile engine

9.1. Dismantle a two wheeler engine for servicing

9.2. Assemble the engine in proper sequence
9.3. Draw a preventive maintenance chart for a two wheeler engine

COURSE CONTENT

1) Study of valve timing diagrams of a four stroke Diesel & Petrol engines using a simulated model
2) Study of port timing diagrams of a two stroke Diesel&Petrol engines using a simulated model
3) Performance test on a single cylinder, water cooled diesel engine
4) Performance test on a single cylinder, air cooled, petrol engine
5) Heat balance test on a single cylinder, water cooled diesel engine
6) Economic speed test on a single cylinder, air cooled, petrol engine
7) Morse test on a multicylinder Petrol/Diesel engines
8) Volumetric efficiency of a single/two stage reciprocating air compressor
9) Dismantle and assembly of a two wheeler engine(The subject teacher is advised to organise a visit to any automobile service unit)

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTION AND EXAMINATION
CURRICULUM-16

V Semester

Sub code	C16-Subjects	No of Periods per week		Total periods per semester	Scheme of Examination			
		Theory	Practice		Duration (Hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY								
M-501	Industrial Management & Smart Technologies	5		75	3	20	80	100
M-502	Industrial Engineering-Estimating and Costing	6		90	3	20	80	100
M-503	Refrigeration & Air-conditioning	5		75	3	20	80	100
M-504	Energy sources & Power Plant Engineering	5		75	3	20	80	100
M-505	Computer Aided Manufacturing systems	5		75	3	20	80	100
PRACTICAL								
M-506	Computer Aided Drafting & CNC lab		6	90	3	40	60	100
M-507	Non-Conventional Energy sources and R&AC lab		3	45	3	40	60	100
M-508	Life Skills		3	45	3	40	60	100
M-509	Workshop Practice - III		4	60	3	40	60	100
	T O T A L	**26**	**16**	**630**		**260**	**640**	**900**

Industrial Management & Smart Technologies

Subject Title : Industrial Management & Smart Technologies
Subject Code : M-501
Periods/Week : 5
Period/Semester : 75

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage Of Marks	Short Answer Questions	Essay Type Questions
1.	Basics of Industrial Management	06	13	1	1
2.	Organisation structure & Organisational behaviour	10	18	1	$1^{1/2}$
3.	Production Management	10	18	1	$1^{1/2}$
4.	Materials Management	08	13	1	1
5	Maintenance management & Industrial Safety	08	13	1	1
6	Entrepreneurship Development	08	13	1	1
7	Total Quality Management	05	06	2	
8	Smart technologies	20	16	2	1
	Total	**75**	**110**	**10**	**08**

1. Basics of Industrial Management

On completion of the course the student will be able to

1.0 Understand the principles of management as applied to industry.

1.1 Define industry, commerce (Trade) and business.
1.2 Know the need for management.
1.3 Understand the evolution of management
1.4 Understand functions of Management.
1.5 Explain the principles of scientific management.
1.6 Explain the principles of management.
1.7 Differentiate between management and administration.
1.8 Understand the nature of management as a profession
1.9 Differentiate between supervisory, middle and Top level management
1.10 Explain the importance of managerial skills (Technical, Human, Conceptual)

2. Organisation Structure & organisational behaviour

Know types of ownerships, the organisation structure of an industry and the behaviour of an individual in an organisation.

2.1 Understand the philosophy and need of organisation structure of an industry.
2.2 Understand the line, staff and Functional organisations
2.3 Understand the Authority and Responsibility Relationships
2.4 Understand the differences between Delegation and decentralization
2.5 Explain the factors of effective organisation.
2.6 Outline the communication process
2.7 State motivation theories.

2.8 State Maslow's Hierarchy of needs.
2.9 List out different leadership models.
2.10 Explain the trait theory of leadership.
2.11 Explain behavioural theory of Leadership.
2.12 Explain the process of decision making.
2.13 Assessing Human resource requirements
2.14 Know the concept of Job analysis, Job description and specifications
2.15 Understand the process of recruitment, selection, training and development
2.16 Understand types of business ownerships
2.17 Differentiate between the business ownerships
2.18 Know the objectives of Employee participation
2.19 Understand the meaning and definition social responsibilities
2.20 Corporate social responsibility

3. **Production management**

Understand the different aspects of production management.

3.1 Identify the factors of Plant Location
3.2 Know the objectives of plant Layout
3.3 Understand the principles of plant Layouts
3.4 Explain the types of plant Layouts
3.5 Relate the production department with other departments.
3.6 State the need for planning and it's advantages.
3.7 Explain the stages of Production, planning and control.
3.8 Know the basic methods demand forecasting
3.9 Explain routing methods.
3.10 Explain scheduling methods.
3.11 Explain dispatching.
3.12 Explain Break Even Analysis
3.13 Define supply chain Management, competitive strategy, Supply chain strategy
3.14 Draw PERT/CPM networks.
3.15 Identify the critical path

4. Materials Management

*Understand the role of materials management industries***.**

4.1 Explain the importance of materials management in Industry.
4.2 Know Functions of Materials Management
4.3 Derive expression for inventory control.
4.4 Explain ABC analysis.
4.5 Define safety stock.
4.6 Define reorder level.
4.7 Derive an expression for economic ordering quantity.
4.8 Know the functions of Stores Management,
4.9 Explain types of store layouts.
4.10 List out stores records.
4.11 Explain the Bin card.
4.12 Describe Cardex method.
4.13 Explain general purchasing procedures
4.14 Explain tendering, E-tendering and E-procurement procedures
4.15 List out purchase records.
4.16 Know the applications of RFID (Radio Frequency Identification Device)
4.17 Understand the applications of RFID in material management

5. Maintenance Management & Industrial Safety

Comprehend the Importance of Maintenance Management & Safety procedures

5.1 Explain the importance of maintenance management in Industry.
5.2 Know the Objectives of maintenance management
5.3 Know the activities of maintenance management
5.4 Understand the importance of Preventive maintenance
5.5 Understand the need for scheduled maintenance
5.6 Differentiate between scheduled and preventive maintenance
5.7 Know the principles of 5 s for good house keeping
5.8 Explain the importance of safety at Work place.
5.9 List out the important provisions related to safety.
5.10 Explain hazard and accident.
5.11 List out different hazards in the Industry.
5.12 Explain the causes of accidents.
5.13 Explain the direct and indirect cost of accidents.
5.14 Understand the types of emission from process Industries, their effects on environment and control
5.15 Understand the principles of solid waste management

6. Entrepreneurship Development.

Understand the role of entrepreneur in economic development and in improving the quality of life.

6.1 Define the word entrepreneur.
6.2 Explain the requirements of an entrepreneur.
6.3 Determine the role of entrepreneurs in promoting Small Scale Industries.
6.4 Describe the details of self-employment schemes.
6.5 Characteristic of successful entrepreneurs
6.6 Explain the method of site selection.
6.7 List the financial assistance programmes.
6.8 List out the organisations that help an entrepreneur
6.9 Know the use of EDP Programmes
6.10 Understand the concept of make in India, Zero defect and zero effect
6.11 Understand the importance for startups
6.12 Explain the conduct of demand surveys
6.13 Explain the conduct of a market survey
6.14 Evaluate Economic and Technical factors.
6.15 Prepare feasibility report study

7. **Total Quality Management:**

Understand the concepts adopted in total quality management

7.1 Explain the concept of quality.
7.2 List the quality systems and elements of quality systems.
7.3 State the principles of quality Assurance.
7.4 Understand the basic concepts of TQM
7.5 Know the Pillars of TQM
7.6 List the evolution of ISO standards.
7.7 Explain ISO standards and ISO 9000 series of quality systems.
7.8 List the beneficiaries of ISO 9000.

7.9 Explain the concepts of ISO 14000
7.10 Know the overview of PDCA cycle

8. Smart Technologies

8.1 Get an overview of IoT

8.1.1 Define the term IoT
8.1.2 Know how IoT work
8.1.3 List the key features of IoT
8.1.4 List the components of IoT : hardware, software, technology and protocols
8.1.5 List the advantages and disadvantages of IoT

8.2 IoT Applications

8.2.1 Smart Cities
8.2.2 Smart Energy and the Smart Grid
8.2.3 Smart Transportation and Mobility
8.2.4 Smart Home, Smart Buildings and Infrastructure
8.2.5 Smart Factory and Smart Manufacturing
8.2.6 Smart Health
8.2.7 Food and Water Tracking and Security
8.2.8 Social Networks and IoT

Course Content

1. Basics of Industrial Management

Introduction: Industry, Commerce and Business; Definition of management; Characteristics of management; Functions of management - Planning, Organizing, Staffing, Directing, Co-ordination, Controlling, Motivating, Communication, Decision Making; Principles of scientific management: – F.W.Taylor, Principles of Management: Henry Fayol; Administration and management; Nature of management; levels of management; managerial skills;

2. Organisation Structure & organisational behaviour

Organizing - Process of Organizing; Line/Staff and functional Organizations, Decentralization and Delegation, Effective Organizing; Communication, Motivational Theories; Leadership Models; Human resources development; Forms of Business ownerships: Types – Sole proprietorship, Partnership, Joint Stock Companies, Cooperative types of Organizations; Employee participation in management; Corporate Social responsibility;

3. Production management

Definition and importance; Plant location and layout; Types of production -job, batch and mass; production Planning and Control: Demand forecasting, routing, scheduling, dispatching and follow up; Break even analysis; Supply chain Management (Definition, Competitive strategy Vs Supply chain Strategy, Supply chain drivers); Project scheduling; Application of CPM and PERT techniques; simple numerical problems;

4. Materials Management

Materials in industry, Basic inventory control model, ABC Analysis, Safety stock, re-order level, Economic ordering quantity, Stores Management: Stores layout, stores equipment, Stores records, purchasing procedures, e-tendering, e-procurement; purchase records, Bin card, Cardex RFID (Radio Frequency Identification Device)application in materials management;

5. Maintenance Management & Industrial Safety

Objectives and importance of plant maintenance, Different types of maintenance, Nature of maintenance problems, Range of maintenance activities, Schedules of preventive maintenance, Advantages of preventive maintenance, 5 S principles; Importance of Safety at work places; Causes of accidents-psychological, physiological and other industrial hazards; Domino sequence;

methods of promoting safe practices; Pollution control in process industries; Introductory concepts on Solid waste management (General introduction including definitions of solid waste including municipal, hospital and industrial solid waste, Waste reduction at source – municipal and industrial wastes)

6. Entrepreneurship Development.

Definition of Entrepreneur; Role of Entrepreneur; Concept of Make In India, ZERO defect, Zero Effect, Concept of Start-up Company, Entrepreneurial Development: Role of SSI, MSME, DICs, Entrepreneurial development schemes; Institutional support, financial assistance programmes; Market survey and Demand survey; Preparation of Feasibility study reports

7. Total Quality Management:

Total Quality Management (TQM)- Concept of quality discussed by B. Crosby W. Edward, Deming, Joseph M. Juran, Kooru Ishikawa, Genichi Taguchi, Shigco Shingo. Quality systems – Definitions of the terms used in quality systems like, quality policy, quality management, quality systems, Stages of development of ISO 9000 series , ISO-14000, Deming's PDCA Cycle (Plan, Do, Check and Action). Japanese Quality Management, culture, Kaizen Strategy (continuous improvement).

8. Smart Technologies :

Overview of IoT - Define IoT, how IoT work, key features of IoT, components of IoT : hardware, software, technology and protocols, advantages and disadvantages of IoT - IoT Applications - Smart Cities, Smart Energy and the Smart Grid, Smart Transportation and Mobility, Smart Home, Smart Buildings and Infrastructure, Smart Factory and Smart Manufacturing, Smart Health, Food and Water Tracking and Security, Participatory Sensing, Social Networks and IoT.

REFERENCE BOOKS

1. Industrial Engineering and Management -by O.P Khanna
2. Production Management- by Buffa.
3. Engineering Economics and Management Science - by Banga & Sharma.
4. Personnel Management by Flippo.
5. Production and Operations Management –S.N. Chary
6. Converging_Technologies_for_Smart_Environments_and_Integrated_Ecosystems_IERC_Book_ Open_Access_2013 pages-54-76
7. Supply Chain Management –Sunil Chopra and Meindl, PHI publishers

8 5 S made easy by David Visco

Industrial Engineering-Estimation and Costing

Subject Title : Industrial Engineering-Estimation and Costing
Subject Code : M-502
Periods/Week : 06
Periods per Semester : 90

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer Questions	Essay Type Questions	Unit Test Syllabus
1	Introduction	02	03	1	--	Unit Test – I
2	Method Study	15	18	1	$1^{1/2}$	
3	Work Measurement	15	18	1	$1^{1/2}$	
4	Quality Control	15	16	2	1	
5	Fundamentals of Estimation and Costing	06	06	2		Unit Test - II
6	Estimation of weights and volumes of Material	14	18	1	$1^{1/2}$	
7	Estimation of Machining Times	08	13	1	1	
8	Estimation of cost in Welding, Forging and Foundry processes	15	18	1	$1^{1/2}$	
	Total	**90**	**110**	**10**	**08**	

OBJECTIVES:

1. Introduction

1.1 Appreciate scope of Industrial engineering.
1.2 Understands the work study as one of the means to improve productivity
1.3 State the objectives of work study.
1.4 State the techniques of work study

2. Method Study

2.1 Apply method study to a given situation.
2.2 State the steps involved in method study.
2.3 Identify the charts used in method study.
2.4 Assemble the elements with symbols to form the required chart.
2.5 State the question in their order to analyse the operational sequence.
2.6 Analyse the question to form the best sequence.
2.7 Conclude the best method of doing work
2.8 Identify the therbligs used in micro motion study
2.9 Know the procedure to build up SIMO chart .

3. Work Measurement

3.1 State the purpose of work Measurement.
3.2 Describe the procedure of making Time study.
3.2 Explain the need for rating factor.
3.3 Compute normal time.
3.4 Explain the importance of Allowances.
3.5 Compute the standard time for an operation using observed time.
3.6 State the advantages of PMTS (Predetermined Motion Time Standards).
3.7 State the Procedure of PMTS

3.8 State the purpose of work sampling.
3.9 State the advantages of work sampling.
3.10 Describe the method of conducting work sampling.

4. **Quality Control**

4.1 Understand the concept of statistical Quality control
4.2 State the characteristics of normal distribution.
4.3 Construct control charts for variables and attributes.
4.4 Interpret control chart for “process in control” or “process out of control”.
4.5 Select proper chart for a given situation.
4.6 State the principles of “Random Sampling’’.
4.7 Differentiate Random sampling with 100% inspection
4.8 know the different types of sampling plans
4.9 Compute the probability of acceptance of a lot for a given single sampling plan.
4.10 Draw O.C. curve for single sampling plans.
4.11 Understand the various terms used in O.C. Curves.
4.12 Know the application of basic quality tools for continuous improvement
4.13 Know the importance and applications of Six Sigma
4.14 Understand the basic steps of SIX Sigma

5 Fundamentals of estimation and Costing

5.1 Define Estimation.
5.2 List the qualities of Estimator.
5.3 List the objectives and functions of estimation.
5.4 Explain the various constituents of estimation.
5.5 Explain the estimating procedure
5.6 Define Costing
5.7 List the objectives of costing
5.8 Explain the elements of costing
5.9 Explain the components of cost - prime cost, factory cost, office cost and total cost
5.10 Calculate the cost of a product taking into consideration all the items.
5.11 Calculate the selling price of a Product.
5.12 Define Depreciation
5.13 Explain the causes of depreciation
5.14 Compute depreciation by Straight line method, Sinking fund method, Reducing balance method, Sum of Years digits method.

6 Estimation of weights and Volumes of materials

6.1 Divide the component drawing into simple and smaller geometrical configurations.
6.2 Calculate the volumes and the weight of the material required.
6.3 Estimate the cost of material.
6.4 Solve simple problems on the above.

7 Estimation of Machining Times

7.1 Estimate time required for machining like turning, drilling, shaping, boring, screw cutting and grinding.
7.2 Use standard tables for feeds, cutting speeds.
7.3 Solve problems on the above.

8 Estimation of welding, forging and Foundry cost

8.1 Estimate the cost of Fabrication by Gas welding
8.2 Estimate the cost of Fabrication by Arc welding.
8.3 Estimate the cost of Gas cutting
8.4 Explain various forging losses
8.5 Estimate the length, net and gross weight and cost of forging for a given component.
8.6 Explain the allowances provided in foundry.

8.7 State the various costs involved in estimating foundry cost
8.8 Estimate foundry cost.

COURSE CONTENT

1. **Introduction:** Definition of industry and industrial engineering, scope and role of industrial engineering fields of applications. Productivity:Production and productivity; Work Study: Introduction, its relation with productivity aims, objectives and application of work study, basic procedure and techniques of work study.

2. **Method Study:** Definition objectives, basic procedures of methods study. Recording techniques, operation process chart, flow process chart, machine chart, flow diagrams, string diagrams, two hand process charts, questioning technique procedure to develop, install and maintain new methods. **Micro Motion Study:** Definition and objectives, techniques of micro motion study, Therbligs and their symbols, use of therbligs, SIMO chart and its application;

3. **Work Measurement:** Procedure of stop watch time study, General rules for breakdown of job into elements; performance rating, its meaning, standard rating, rating of operators, conditions for operators variation at work place rating scales, rating factors, calculation of basic time. Allowances- purpose, types. Determination of Standard time through Work Sampling, Predetermined motion time standard, standard data;

4. **Quality Control**: Introduction to Statistical Quality Control; Basic Quality tools for process improvement; Chance and Assignable causes of Quality variation, Advantages of shewhart control charts, Process Control charts for variables, X, R; Control Charts for attributes: P-Chart, nP Chart and 100p Chart. Product Control: Acceptance Sampling; 100% Inspection, operating characteristic curve (O.C. curve);Single, Double and Multiple sampling Plans, SS Plan; Producers Risk and Consumer's Risk, Indifference Quality level, Average Outgoing quality (AOQ) curve, AOQL; ABC Standard; Six sigma steps (Define-D, Measure-M, Analyze-A, Improve-I, Control-C);

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5. **Fundamentals of estimation and Costing:**Objectives and functions of estimation; Principal constituents of the estimation; estimation procedure: Labour, materials, overheads, miscellaneous expenses; Objectives of cost accounting – elements of cost viz., material, labour and expenses – Calculate the selling price of a product; Depreciation-causes-Calculation of depreciation charges by a few important methods (Straight line method, Sinking fund method, Reducing balance method, Sum of Years digits method)

6. **Estimation of weights and Volumes of materials** : Principles of dividing the component drawing into simple and smaller geometrical configurations; Calculation of volumes and the weight of the material; Estimating the cost ; Exercises in the calculation of weight of material and cost.

7. **Estimation of Machining Times:** Basic formula for the calculation of machining times for operations like, turning, drilling, shaping, boring, screw cutting and grinding,. Use of standard table of feeds, cutting speed etc; Exercises for the calculation of machining time for the above mentioned operations.

8. **Estimation of welding, forging and Foundry cost:** Estimate the cost of fabrication by gas welding and arc welding; Estimation of Forging Cost: Estimation of stock weight, net weight, gross weight, losses in forging; Exercises in the estimation of length, net and gross weight

and cost of forging for given components. Estimation of foundry cost: Process for finding the foundry cost, cost of metal, cost of metal melting, moulding, core cost, cleaning cost, grinding and tooling cost. Exercises in estimating the foundry cost.

REFERENCE BOOKS

Work study – by Ralph Banes.

Work study – by I.L.O.

Industrial Engineering & - Estimating & Costing- byM.ZakriaBaig.

Industrial Engineering & - Management Science – by T.R.Banga

S.Q.C – by Grant &Levenworth

S.Q.C –by Juran

S.Q.C –by Gupta

Industrial engineering and estimating and costing by M. Gopalaiah.

Industrial Engineering & Estimating& Costing – byM.ZakriaBaig..

Industrial Engineering & Management Science. – by T.R.Banga

Estimating & Costing - by Agarwal.

Estimating & costing -by Narang& Acharya

Estimating & Costing -by T.R. Banga – Sharma.

Implementing six sigma -Forrest Breyfogle, Smarter Solutions Inc

Refrigeration and Air conditioning

Subject title : Refrigeration and Air conditioning
Subject code : M-503
Periods per week : 05
Periods per semester : 75

TIME SCHEDULE

Sno.	Major Topics	No. Of Periods	Weightage	SAQ	EAQ	Unit Test bifur-cation
1	Fundamentals of Refrigeration & Air Refrigeration	10	13	01	01	Unit Test – I
2	Vapour compression Refrigeration Systems	10	16	02	01	
3	Vapour absorption Refrigeration Systems	08	13	01	01	
4	Refrigeration equipment	12	16	02	01	
5	Refrigerants & Refrigeration Applications	08	13	01	01	Unit Test – II
6	Fundamentals of Air conditioning & Equipment	12	16	02	01	
7	Psychrometry	07	10	-	01	
8	Applications of Air conditioning	08	13	01	01	
Total		**75**	**110**	**10**	**08**	

OBJECTIVES
Upon completion of the course the student shall be able to

1. **Understand the various methods of Refrigeration**
1.1. Define refrigeration
1.2. Know the history of refrigeration.
1.3. Know the different methods of refrigeration such as ice, dry ice, steam jet water refrigeration, liquid nitrogen refrigeration.
1.4. Express unit of refrigeration in Terms of ton of refrigeration
1.5. Define coefficient of Performance.
1.6. Evaluate power required per ton of refrigeration.
1.7. Know the principle of open air refrigeration.
1.8. Analyse Carnot refrigeration Cycle.
1.9. Analyse Bell-Coleman air-cycle.
1.10. Explain principle of closed air Refrigeration.
1.11. Compare open air system with closed air system.

2. **Understand Vapour compression refrigeration system**
2.1. Explain the importance of vapour compression system.
2.2. Analyse vapour compression refrigeration with the help of T-S and P-H diagrams
2.3. Distinguish between wet and dry compression.

2.4. Know the effects of under cooling and super heating and effect of pressure changes on COP.
2.5. State the use of flash chamber and accumulator
2.6. Calculate COP of plant working on vapour compression system

3. **Understand vapour absorption refrigeration system:**
3.1. Explain principle of simple vapour absorption systems.
3.2. List refrigerant – Absorber pairs in the above system.
3.3. State the desirable properties of refrigerants, absorbers.
3.4. Illustrate the working principle of vapour absorption refrigeration system.
3.5. Differentiate two fluid system and three fluid absorption system.
3.6. Illustrate the working of Electrolux refrigeration

4. **Know the equipment used in refrigeration**
4.1. Illustrate different types of compressors such as reciprocating and rotary types.
4.2. State the function of condenser and classify the condensers,
4.3. Explain different types of condensers such as Air cooled, Water cooled-shell & tube, shell and coil, Evaporative condensers with the help of a legible sketch.
4.4. State the function of evaporator and classify the evaporators,
4.5. Illustrate various types of evaporators
4.6. Illustrate the various types of expansion devices
4.7. Explain the refill type and throw away type dryers.

5. **Know the refrigerants and refrigeration applications**
5.1. Distinguish between primary and secondary refrigerants.
5.2. State the requirements of Refrigerants
5.3. List the properties of refrigerants
5.4. List commonly used refrigerants
5.5. Illustrate the working of domestic refrigerator.
5.6. Illustrate the working of ice Plant
5.7. Illustrate the working of water cooler
5.8. Illustrate the working of cold storage

6. **Understand fundamentals of Air conditioning and air conditioning equipment**
6.1. Define air conditioning
6.2. List modern applications of Air conditioning.
6.3. Explain Air conditioning as applied to human comfort
6.4. Illustrate the functions of fans, ducts, filters , dust collector.
6.5. Explain the use of heating and cooling coils
6.6. Explain the air distribution system.

7. **Understand the science of Psychrometry**
7.1. Define the terms humidity, Relative humidity, dew point, DBT & WBT, Absolute humidity, humidity ratio
7.2. Explain the features of psychrometric chart
7.3. Plot psychometric processes on the above chart
7.4. Explain the psychrometric patterns for heating and cooling processes.

8. **Appreciate the applications of A/C**
8.1. Illustrate the working of air coolers
8.2. Illustrate the working of window air – conditioner
8.3. Illustrate the working of cooling tower installations
8.4. Illustrate the working of A/c systems viz., centralised and unitary systems
8.5. Illustrate the working of summer-winter-year round air conditioners

COURSE CONTENT

REFRIGERATION

1. **Fundamentals of Refrigeration and Air Refrigeration:**
   - 1.1. **Introduction** – Definition and meaning of refrigeration,
   - 1.2. Methods of refrigeration
   - 1.3. Unit of refrigeration and COP
   - 1.4. Simple problems.
   - 1.5. Thermodynamic analysis of Refrigeration cycles- Carnot refrigeration cycle- Air refrigeration cycle (Bell – Colomen)(problems on air cycles omitted)
   - 1.6. Open air and closed air systems of refrigeration

2. **Vapour Compression Refrigeration Systems.**
   - 2.1. Working of VC system with p-h and T-s diagrams- Expression for COP (derivation omitted) –
   - 2.2. Factors effecting the COP viz. Sub cooling, superheating, pressure changes
   - 2.3. Functions of flash chamber and accumulator (sketches omitted)their location in VC circuit
   - 2.4. Simple problems on COP.

3. **Vapour absorption Refrigeration Systems**
   - 3.1. Layout of vapour absorption system – principle of working – expression (without proof) for C.O.P –
   - 3.2. List of popular refrigerants and absorbents – two fluid & three fluid systems
   - 3.3. Layout of Electrolux refrigerator – working principle
   - 3.4. Comparison of vapour absorption and vapour compression systems.

4. **Refrigeration Equipment :**
   - 4.1. Compressors – Classification and sub classification – working of Hermetic and semi hermetic type compressors with sketches – Rotary compressors – working of vane type and screw type compressors with sketches
   - 4.2. Condensers –Classification – layout of Air cooled, water cooled, Evaporative types – their working
   - 4.3. Evaporators – types of evaporators - working principle of shell and tube and dry evaporators with sketches – flooded type – working
   - 4.4. Expansion devices – types of expansion devices- working principle of capillary tube and thermostatic expansion devices with sketches
   - 4.5. Driers – types – working principle of refill type and throw away type driers.

5. **Refrigerants & Refrigeration Applications :**
   - 5.1. Primary and secondary refrigerants with examples – requirements of a refrigerant – properties of refrigerants – Commonly used refrigerants
   - 5.2. Applications of refrigeration – working principle (with line sketches) of
     - 5.2.1.Domestic refrigerator
     - 5.2.2. ice plant
     - 5.2.3.Water cooler
     - 5.2.4.Cold storage.

AIR CONDITIONING

6. **Fundamentals of A/c and A/c equipment**
   - 6.1. Definition of air conditioning – concept of Comfort air conditioning
   - 6.2. Factors affecting human comfort – comfort chart
   - 6.3. A/C Cycle equipment such as fans, supply ducts, outlets, return outlets and ducts
   - 6.4. Air distribution- Radial perimeter system, loop perimeter system, extended plenum system
   - 6.5. Filters & dust collectors –wet, dry, electric & viscous types, Cyclone air cleaner, air washer
   - 6.6. Heating and cooling coils

7. **Psychrometry**
   - 7.1. Psychrometry – Psychrometric terms – Practical applications of psychrometric terms
   - 7.2. Psychrometric processes
   - 7.3. Psychrometric chart – Simple direct problems applying psychrometric chart
   - 7.4. Psychrometric patterns for heating & cooling processes.

8. **Applications of Air conditioning**
   - 8.1. Working principle with layout for the following air conditioning appliances:
     - 8.1.1. Air coolers
     - 8.1.2. Window air conditioner – (split & package type) ,
     - 8.1.3. Cooling towers
     - 8.1.4. A/C systems for human comfort – summer/winter/year round air conditioning, central A/C system and unitary system

REFERENCE BOOKS

1. Refrigeration and Air Conditioning – by Domakundavar
2. Refrigeration and Air Conditioning – by Arora (MGH Publishers)
3. Basic Refrigeration and Air conditioning – by P N Ananthanarayana,(MGH Publishers)
4. Refrigeration and Air Conditioning – by Sarao & Gabi,
5. Refrigeration and Air Conditioning – by Dosatt
6. Refrigeration and Air Conditioning – by Stoecker

Energy Sources and Power Plant Engineering

Subject title : Energy Sources and Power Plant Engineering
Subject code : M-504
Periods per week : 05
Periods per semester : 75

TIME SCHEDULE

S.NO	Major Topics	No. of Periods	Weightage of Marks	SAQ	EAQ	Unit Test bifur-cation
1	Introduction to renewal sources of Energy	03	03	01	-	Unit Test – I
2	Solar Energy	16	26	02	02	
3	Wind energy	08	13	01	01	
4	Fuel Cells and MHD Generator	08	13	01	01	
5	Bio Energy	08	13	01	01	Unit Test – II
6	Tidal Energy	08	13	01	01	
7	Thermal power plants	12	16	02	01	
8	Nuclear power plants Environmental pollution	12	13	01	01	
	Total	**75**	**110**	**10**	**8**	

OBJECTIVES

Upon the completion of the course the student shall be able to

1. Understand the need of energy sources

1.1. State various energy sources, give examples.
1.2. Classify energy sources as renewable and non renewable energy.
1.3. State advantages and disadvantages of renewable and non renewable energy sources.
1.4. Appreciate the need of renewable energy sources.
1.5. State the different types of renewable energy sources

2. Understand the concept of solar energy .

2.1. State the amount of solar radiation reaching the earth's surface,
2.2. Determine the solar constant,
2.3. State the principle of measuring solar radiation by pyranometer and pryheliometer,
2.4. State the principle of conversion of solar radiation into heat.
2.5. Explain the function of liquid flat collector
2.6. Explain the working principle of solar air heater with a legible sketch,
2.7. State the applications of solar air heater,
2.8. Identify different types of concentrating collectors,
2.9. Explain the working principle of concentrating collector (focusing type parabolic trough collector and flat plate collectors with plain reflectors).
2.10. State the different methods of storing solar energy,
2.11. Explain the methods of sensible heat, latent heat and thermo chemical storage.

2.12. Explain the working principle of solar pond with a sketch,
2.13. State the applications of solar pond,
2.14. Explain the construction details and working principle of different types of solar water heater with the help of sketch
2.15. Explain the construction details and working principle of solar space heater with the help of sketch
2.16. Explain the construction details and working principle of absorption refrigerator type solar space cooler with the help of sketch
2.17. Explain the construction details and working principle of solar still with the help of sketch,
2.18. Explain connective type of solar drier.
2.19. Illustrate the working principle of Box type solar cooker,
2.20. State the principle of photo –voltaic conversion.
2.21. State the working principle of solar cell,
2.22. State the use of photo voltaic cell for power generation
2.23. Explain the solar photovoltaic arrays
2.24. Explain the solar water pumping system with a sketch,
2.25. State the advantages and limitations of solar energy conversion.

3. Understand the concept of wind energy

3.1. Explain the power available in the wind and force caused by it on the blades.
3.2. State the collection of wind data and estimate the energy,
3.3. State the different considerations for site selection for installing wind mill.,
3.4. Identify the basic components of a wind mill,
3.5. Illustrate the construction details and working principle of the wind mill,
3.6. State the differences between horizontal axis and vertical axis type wind mills,
3.7. Define the terms co-efficient of performance and tip speed ratio,
3.8. Plot curves to indicate the variation of co-efficient of performance with tip speed ratio.
3.9. Illustrate the method of generation of electricity by wind mill**,**

4. Comprehend Fuel Cells and MHD Generator

4.1. State the working principle of fuel cell
4.2. Illustrate the construction details and working principle of Bacan's High pressure fuel cell .
4.3. State the different types of fuels used in fuel cells
4.4. Explain the working principle of aluminium air fuel cell with a legible sketch,
4.5. Explain the working principle of MHD Generator a legible sketch**.**

5. Understand Bio- Energy

5.1. Understand the meaning of bio-mass and bio-gas.
5.2. State the principle of bio-gas generation,
5.3. State the chemical composition and properties of bio-gas,
5.4. List the applications of bio-gas,
5.5. List the different types of bio-gas plants,
5.6. Illustrate the construction details and working principle of fixed dome type and floating dome type bio-gas plants,
5.7. State the different materials used for bio-gas generation,
5.8. Express bio-gas plant capacity,
5.9. State the methods of generator control and load control,

6. Understand Tidal energy

6.1. Identify the energy available in tides and its usefulness in conversion,
6.2. State the working principle of tidal power plant,
6.3. State the different operation methods of utilisation of tidal energy,
6.4. Explain single basin and double basin arrangements,
6.5. State the site requirements for installation of tidal power plant.
6.6. State the advantages and limitations of tidal power generation

7. Analyse the elements of Thermal power plant

7.1. Illustrate the layout of a thermal power plant.
7.2. Locate the Boiler, super heater, turbine, Electric Generator, Condenser and hot well pump in the layout
7.3. Explain function of circulating water pump, Economiser, Air pre heater, Soot– Blower.
7.4. Explain the dust extraction in Electrostatic precipitator
7.5. Explain about the ash removal, water cooling
7.6. Explain about the feed water treatment.
7.7. Explain about the coal handling, coal storage
7.8. Identify the fuel handling equipment.
7.9. Trace the ash disposal system
7.10. State the necessity of condensing the steam
7.11. State the principle of condensation in condenser,
7.12. List different types of condensers,

8. Analyse the elements of Nuclear power plant

8.1. Understand the chain reaction,
8.2. Understand the process of nuclear fission and nuclear fusion.
8.3. List nuclear fuels- nuclear materials with examples,
8.4. State the characteristics of atomic power plants,
8.5. Illustrate the principle of working of a nuclear reactor,
8.6. Classify the nuclear reactors ,
8.7. Illustrate the working principle and constructional details of Nuclear power plants
8.8. Explain the effects of nuclear radiation,
8.9. Explain the disposal of nuclear waste (i) Ground (ii) Air (iii) Ocean

COURSE CONTENT

1. Introduction:

1.1. Various energy sources – examples for energy sources – relative advantages and disadvantages
1.2. Need for alternate sources of energy – types of non conventional energy sources – basic principles of solar energy, wind energy, energy from bio- mass and bio-gas, tidal and wave energy, Geothermal energy, hydrogen energy, fuel cells**,**

2. Solar Energy:

2.1. **Solar Radiation**: Solar constant – solar radiation at earth's surface – instruments for measuring solar radiation – pyranometer, pryheliometer.
2.2. **Solar Energy Collection**: Principle of conversion of solar radiation into heat Liquid flat collectors – solar air heater Application of solar air heater – concentrating collectors –focusing type– parabolic collector –plate collectors with plane reflectors.

2.3. **Solar Energy Storage:** Methods of storing solar energy – sensible heat storage , latent heat storage and thermo chemical storage – solar pond – working principle and description of solar pond with a schematic diagram – applications of solar pond.

2.4. **Solar Energy Applications**

2.4.1. Solar water heater – natural circulation type and forced circulation type

2.4.2. Solar space heater – passive type and active type

2.4.3. Solar space cooling – absorptive refrigeration system

2.4.4. Solar still

2.4.5. Solar drier – cabinet type and convective type

2.4.6. Solar cooker

2.5. **Photo voltaic conversion :** solar cell – working principle – cell – photo voltaic cell for power generation, solar photo voltaic arrays

2.6. solar water pumping system

2.7. Advantages and disadvantages of solar energy.

3. Wind Energy

3.1. Introduction – power in the wind forces on the blades – wind data – energy estimation – site selection considerations

3.2. Basic components of a wind mill – construction details and working principles of – horizontal axis type: multi blade, propeller type, Dutch type

3.3. Vertical axis type: Savonius type, Darrius type- variation of co efficient of performance with tip speed ratio

3.4. Electric generation by wind mill – generator control – load control.

4. **Fuel Cells and MHD Generator**

4.1. Working principle – types of fuels used – advantages and limitations

4.2. Bacon's High pressure fuel cell – construction details and working principle

4.3. Air fuel cell working principle

4.4. Working principle of MHD Generator

5. **Bio Energy**

5.1. Bio Energy – Introduction to bio – mass. Bio-mass conversion into energy. Bio-gas generation – composition and properties of bio-gas – applications of bio-gas.

5.2. Classification of bio-gas plants – continuous and batch type, the dome and drum type, floating gas holder and fixed dome type

5.3. construction details and working principle of fixed dome type and floating gas holder type bio – gas plants –

5.4. Materials used for bio-gas generation – capacity of bio-gas plant – starting of bio-gas plant-method of control of generator and load

6. **Tidal Energy**

6.1. Introduction to tidal power – components of tidal power plants

6.2. Operation methods and utilisation of tidal energy

6.3. Single basin and double basin arrangements- site requirements and installation

6.4. Advantages and limitations of tidal power generation**.**

7. **Thermal Power Plants**

7.1. Layout of a Thermal Power Plant, Choice of site, functions of important elements in layouts: Such as Boiler, Condenser, super heater, turbine, Economiser, Air heater, Soot–Blower , Forced draught Fan, Dust collectors, Electro static precipitator

7.2. Feed water system, Circulating water pumps,

7.3. Supporting activities- Such as Water cooling, Feed water treatment, Coal handling, Coal storage, Chimney.

7.4. Description of fuel handling equipment, unloading equipment, preparing equipment,

7.5. Modern ash handling equipment, dust collection and disposal , roots blower.

7.6. Condensers- principles classification – comparison – condensers and vacuum efficiencies

8. **Nuclear Power Plants**:

8.1. Nuclear energy ,chain reaction , list of nuclear materials, reactor, nuclear fission , nuclear fusion characteristics of automatic power plants, nuclear fuels ,

8.2. Working principle of nuclear reactor, classification of reactors

8.3. Working principle of Pressurised water reactor (PWR), Boiling water reactor(BWR)

8.4. Gas Cooled reactor(GCR), liquid metal – cooled reactor,

8.5. Fast breeder reactor

8.6. Effects of nuclear radiation Nuclear waste disposal.

REFERENCE BOOKS

1. Non conventional Energy source by G.D Rai
2. Energy Technology by S. Rao & Dr. D.B. Palek (Non conventional, Renewable and conventional)
3. Solar energy utilisation by G.D.Rai,
4. Introduction to alternate sources of energy by TTTI, Madras
5. Solar energy by S.P. Sukhatme,
6. Advances in bio-gas technology by O.P.Chawla
7 Thermal Engineering by Arora & S. Domkundwar

Computer Aided Manufacturing Systems

Subject Title : Computer Aided Manufacturing Systems
Subject Code : M-505
Periods per week : 05
Period per semester : 75

TIME SCHEDULE

Sl No.	Major Topics	No. Of periods	Weightage	SAQ	EAQ	Unit Test Syllabus
1.	Introduction to Computer aided manufacturing	8	13	1	1	Unit Test – I
2.	Introduction to Numerical Control	8	13	1	1	
3.	CNC and DNC systems	8	13	1	1	
4.	Basic principles of CNC hardware	14	16	2	1	
5	CNC programming	16	16	2	1	Unit Test – II
6	Material handling systems of CAM	8	13	1	1	
7	Flexible manufacturing systems	8	13	1	1	
8	Computer Integrated Manufacturing Systems	5	13	1	1	
TOTAL		**75**	**110**	**10**	**08**	

OBJECTIVES

1. Introduction to Computer aided manufacturing (CAM)

1.1. Appreciate the necessity of computer monitoring and control of manufacturing process
1.2. Define various computer aided manufacturing support functions viz.CAD, CADD, CAE, CAPP, CATD etc.,
1.3. List out the benefits of computer aided manufacture (CAM)
1.4. Illustrate the product cycle of a traditional manufacturing system
1.5. Illustrate the product cycle of a CAM system
1.6. Illustrate an integrated CAD/CAM system
1.7. Explain graphically the various types of production
1.8. State the concept of group technology
1.9. State the advantages and limitations of group technology

2. Introduction to Numerical Control

2.1. Define numerical control (NC)
2.2. List out the advantages and limitations of NC manufacturing system in comparison to tradition manufacturing system
2.3. State the applications of NC systems
2.4. Illustrate an NC machine tool and explain the functions of its principal elements
2.5. Explain with a block diagram the manufacturing methodology of an NC system
2.6. Explain with illustrations the PTP, 1-axis, 2-axis, 3-axis numerical control modes

3. CNC and DNC systems

3.1. Define Computer Numerical control (CNC)
3.2. Illustrate a CNC machine tool and explain the functions of its principal elements
3.3. State the principal differences between NC and CNC systems
3.4. State the advantages of CNC systems over NC systems
3.5. Define direct numerical control (DNC)
3.6. Illustrate a DNC system
3.7. State the features of a DNC system
3.8. List out the advantages and applications of DNC
3.9. Compare NC, CNC and DNC systems
3.10. Illustrate a CNC-CMM
3.11. State the features of CNC-CMM
3.12. Explain the working of CNC-CMM

4. Basic principles of CNC hardware

4.1. State the requirements of machine bed and spindle in a CNC machine tool
4.2. State the basic design principles of CNC machine tool bed and spindle
4.3. State the requirements of spindle and feed drives of CNC machine tools
4.4. Explain the various types of spindle and feed drives used in CNC machine tools
4.5. State the requirements of actuation systems in CNC machine tools
4.6. Explain with illustration the working of a lead screw with recirculating balls and nut
4.7. State the requirements of the guide ways in CNC machine tool
4.8. Explain with illustration the working of antifriction guide ways
4.9. Explain with illustration the working of a linear ball bush
4.10. Illustrate the open and closed loop control systems
4.11. Explain with illustrations the principle of absolute encoders (natural binary& gray)
4.12. Explain with illustrations the principle of incremental encoders
4.13. State the requirements of cutting tool materials in CNC system
4.14. Name the cutting tool materials used in CNC
4.15. State the applications of cemented carbide, coated carbides and ceramic tool materials
4.16. State the requirements of tool manipulations in CNC machine tools
4.17. Explain with illustration the working of a tool magazine (drum type & Chain type)
4.18. Explain with illustrations the working of a automatic tool changer (ATC)
4.19. State the requirements of work holding devices in CNC machine tools
4.20. Explain with illustrations work holding devices – Grid plate, Tomb stone and angle plate

5. CNC Programming

5.1. Explain with a block diagram the various steps involved in developing a part program
5.2. Define manual part programming
5.3. Illustrate a block of a CNC program code in word address format as per ISO
5.4. Explain the syntax of each word in a word address format as per ISO
5.5. Differentiate between Geometry (G) and Miscellaneous (M) codes
5.6. Explain with syntax some of the popular G & M codes
5.7. Write a CNC program for a simple turning job in G & M codes
5.8. State the necessity of tool length and nose radius compensation in CNC programming
5.9. Illustrate the coding of tool length compensation in a CNC program
5.10. Define Computer aided part programming (CAP)
5.11. State the advantages of CAP over manual programming
5.12. Appreciate APT as a popular CAP language
5.13. Illustrate with a block diagram the configuration of CAP with APT
5.14. Explain the syntax of popular Geometry statements of APT language
5.15. Explain the syntax of popular Motion statements of APT language

5.16. Explain the syntax of popular post processor statements of APT language
5.17. Explain the syntax of popular compiler statements of APT language
5.18. Write a program in APT language for a simple drilling job from a given drawing
5.19. Name the commercially available GUI based CAP programming languages and state their advantages over APT

6. Material handling systems in CAM

6.1. State the requirements of material handling systems in CAM
6.2. Differentiate between Primary and Secondary material handling systems
6.3. Define an automated guided vehicle (AGV)
6.4. Explain the various types of AGV with illustrations
6.5. State the applications of various AGV
6.6. Define a Robot
6.7. State the necessity of Robots in manufacturing environment
6.8. Explain various types of Robots with illustrations
6.9. Illustrate an industrial Robot showing its principal elements
6.10. Explain the functions of the Principal components of a Robot

7. Flexible manufacturing systems (FMS)

7.1. State the necessity of FMS
7.2. Explain the meanings of Machine flexibility, Production flexibility, Mix flexibility, Product flexibility, Routing flexibility, Volume flexibility, Expansion flexibility
7.3. Illustrate the layout of a typical FMS showing the principal components
7.4. Explain the functions the principal components of an FMS
7.5. State the features, advantages and applications of FMS

8. Computer Integrated Manufacturing Systems (CIMS)

8.1. Illustrate design functions module, manufacturing functions module and Business functions module of a manufacturing system
8.2. State the necessity of integrating the various modules of a manufacturing system
8.3. Define CIMS
8.4. Illustrate CIMS showing the principal components
8.5. State the benefits of CIM
8.6. Appreciate the concept of lean manufacturing
8.7. List out the steps involved in lean manufacturing
8.8. State the benefits of lean manufacturing

COURSE CONTENT

1. Introduction to Computer aided manufacturing (CAM)

1.1. Role of computers in manufacturing–Computer aided monitoring and control –computer aided manufacturing support functions viz. CAD, CADD,CAE, CAPP,CATD – Benefits of CAM
1.2. Product cycle in traditional and computerized manufacturing environments – linkage of various manufacturing functions through computerized database– Integrated CAD/CAM
1.3. Types of production systems –Transfer line production – Flexible manufacturing system – Standalone CNC system – features and applications of each type
1.4. Group Technology – advantages and limitations

2. Introduction to Numerical Control

2.1. Brief overview of historical development of Numerical control technology – advantages over conventional manufacturing system – Limitations – applications
2.2. Working principle of NC machine tool- elements of NC machine tool

2.3. Manufacturing methodology of NC systems – Part drawing – Part program – Program tape – Tape reader – Controller – Machine tool
2.4. Numerical control modes – Point to point control – One axis control – Simultaneous two axes control – Simultaneous three axes control

3. CNC and DNC systems

3.1. Working principle of CNC machine tool – Principal differences over NC systems – advantages over NC system
3.2. Direct Numerical control – concept – features – advantages –applications
3.3. Comparative treatment of NC, CNC, and DNC systems
3.4. CNC Co-ordinates measuring machine (CNC-CMM) – Principle of working – Principal components – features – advantages – applications

4. Basic principles offence hardware

4.1. Principles of CNC machine tool bed and Spindle design – Spindle drives and Feed drives – DC servo motors – AC servo motors – Stepper motors – Linear motors
4.2. Actuation systems – lead screw with recirculating balls and nut –Antifriction guide ways – Linear ball bush
4.3. Feedback devices – Closed loop CNC control system – Absolute encoders (natural binary & gray) – Incremental encoders
4.4. Materials for cutting tools used in CNC – Cemented carbides – Coated carbides – Ceramics
4.5. Tool holding devices – Drum type and chain type Tool magazines
4.6. Working of automatic tool changer (ATC)
4.7. Work holding devices – Grid plate –Tomb stone

5. CNC programming

5.1. Steps involved in development of part program – Process planning –Axes nomenclature for CNC turning and machining centres – Tool selection – Cutting process parameters selection – Job and tool setup planning – Machine tool path planning – Part program writing – Part program verification
5.2. Manual part programming (as per ISO) – Word address format –meaning of each word – List of preparatory functions – List of miscellaneous functions
5.3. Tool length compensation – Nose radius compensation – Cutter radius compensation
5.4. Computer aided part programming (CAP) – advantages over manual part programming
5.5. List of Geometry, Motion, Post processor and Compiler commands used in APT
5.6. Sample programs for simple turning jobs in G & M codes
5.7. Sample programs in APT for simple Drilling jobs
5.8. Overview of commercially available GUI based CAP programming languages – advantages over APT language

6. Material handling systems in CAM

6.1. Material handling systems – functions in CAM environment – Primary and secondary systems – automated guided vehicle systems (AGVS)
6.2. AGV types – Towing vehicles – Unit load vehicles – Pallet trucks – Fork trucks – Light load vehicles – Assembly line vehicles – their applications
6.3. Robots – areas of application – types of robots
6.4. Layout of an industrial robot – functions of each component

7. Flexible manufacturing systems (FMS)

7.1. Different types of flexibilities – Machine flexibility – Production flexibility – Mix flexibility – Product flexibility – Routing flexibility – Volume flexibility – Expansion flexibility
7.2. Layout of a typical FMS showing principal components
7.3. Components of FMS – CNC machine centres –material handling equipment – Computer control – Human functions
7.4. Features of FMS – advantages – applications

8. Computer Integrated Manufacturing Systems (CIMS)

8.1. Components of a manufacturing system – Design functions module – Manufacturing functions module – Business functions module – Necessity of Integration

8.2. Concept of CIM– Benefits of CIM

8.3. Lean manufacturing – Introduction – steps involved – Benefits of lean manufacturing

REFERENCE BOOKS

1	Numerical Control and Computer Aided Manufacturing	T.K.Kundra,P.N.Rao	TMH
2	Computer Aided Manufacturing	T. K. Kundra, P.N. Rao	MGH Publishers
3	CAD/CAM	Groover and Zimmers	Pearson Education India
4	Lean tools and 5 S	Joe Bronski and fancesco lannelo	Kindle Edition

Computer Aided Drafting & CNC Laboratory

Subject Title : Computer Aided Drafting & CNC Laboratory
Subject Code : M 506
Periods per week : 06
Period per semester : 90

TIME SCHEDULE

Sl No.	Major Topics	No. of periods
1.	Auto CAD toolbars & menus	09
2.	Dimensioning & Hatching	03
3.	2D drawings	12
4.	3D solids and solids tool bars	06
5.	Drawing of 3D components – Bolt & Nut, Screw jack	12
6.	Rendering 3D images	03
7	Study of CNC machine	06
8	Incremental and Absolute system	03
9	G-Codes and M-codes	06
10	Simulation software practice	06
11	Turning exercise – step turning	03
	Turning exercise – circular interpolation	06
	Turning exercise – Taper turning using canned cycle	03
	Turning exercise – Peck drilling using canned cycle	03
	Turning exercise – Thread cutting using canned cycle	06
	Turning exercise – grooving using canned cycle	03
	Total	**90**

Note: This lab should be treated as a single subject. The course work is compulsory in all the exercises. The end examination consists of one question from any of the above exercises

OBJECTIVES

Up on completion of the course the student shall be able to

1. Auto CAD screen and various Tool bars and menus
2. Explain about Dimensioning and Hatching
3. Draw the 2D – drawings like **knuckle joint, screw jack, flange coupling, lathe tool post, eccentric** etc.,
4. Explain about 3D solids and solids tool bar options
5. Drawing of 3D – components like **bolt&nut, screw jack**
6. Rendering of 3D images
7. Study of CNC machine
8. Incremental system and absolute system on dimensioning.

9. G-codes and M-codes and part program writing
10. Simulation software practice
11. Turning exercises like step turning, taper turning, peck drilling, thread cutting, grooving with/without canned cycles using available CNC machine

COURSE CONTENTS

1) Study the Auto CAD screen, various toolbars and menus
   a) Exercises on usage of Draw and modify tool bar.
   b) Exercises on mirror, rotate, array and move commands
2) Exercises on dimension and hatching
3)
   a) Draw the knuckle joint full details & dimensioning
   b) Draw the screw jack 2D drawing
4) Study the 3D solids (primitives) and solids tool bar options
5)
   a) Draw bolt and nut in 3D
   b) Draw various parts of screw jack in assemble them as 3D component
6) Render the 3D images already generated and apply materials and light.
7) Study of CNC machine installed in the laboratory, identify the parts and know the function of parts
8) Useincrementalsystemandabsolutesystemondimensioning.
9) Familiarization with G-codes and M-codes and part program writing
10) Simulation software practice using available softwares
11)
   a) Turning exercise step turning
   b) Turning exercise using circular interpolation (CW/CCW)
   c) Turning exercise taper turning
   d) Turning exercise peck drilling
   e) Turning exercise thread cutting
   f) Turning exercise grooving with/without canned cycles using available CNC machine

Note: ***The CAD softwares available are AUTOCAD, ProgeCAD etc.***
The simulation softwares available in the market:
FANUC, SIEMENS, HI NUMERIC, GSK etc.,

Non conventional Energy sources and R&AC lab

Subject Title : Non conventional Energy sources and R&AC lab
Subject Code : M – 507
Periods per Week : 03
Periods per Semester : 45

TIME SCHEDULE

S.No		Number of Periods
1	C O P of Vapour Compression cycle test rig	03
2	C O P of domestic refrigerator test rig	03
3	C O P of water cooler test rig	03
4	C.O.P. of A.C. system	03
5	Vacuumisation and Charging of refrigeration system	03
6	Servicing & Maintenance of R & AC Equipment	06
7	Study and performance of Pyranometer	03
8	Study of solar appliances	06
9	Study of wind mills	06
10	Study and performance test on photovoltaic cell	03
11	Study of wind speed measuring instruments	03
12	Study of Bio gas plants-KVIC, Janatha, Deenabandhu plants	03
Total		**45**

Note: This lab should be treated as a single subject. The course work is compulsory in all the exercises. The end examination consists of one question from any of the above exercises

OBJECTIVES

Up on completion of the course the student shall be able to

1. C.O.P of Vapour Compression cycle test rig
   1.1. State the scope of performance test on VCR test rig
   1.2. Identify the various components of test rig
   1.3. Draw the experimental lay out and basic cycle
   1.4. State the tool and equipment required
   1.5. State the observations to be made
   1.6. Understand the P-H diagram for given refrigerant
   1.7. Calculate the COP of test rig

2. C.O.P of Domestic refrigerator
   2.1. Identify the various components
   2.2. Draw the experimental layout

2.3. State the observations to be made
2.4. Understand the P-H diagram for given refrigerant
2.5. Calculate the COP of test rig

3. C.O.P of Water cooler test rig
   3.1. Identify the various components
   3.2. Draw the experimental layout
   3.3. State the observations to be made
   3.4. Understand the P-H diagram for given refrigerant
   3.5. Calculate the COP of test rig

4. COP of Air Conditioning system
   4.1. Identify the various components
   4.2. Draw the experimental layout
   4.3. Understand the process humidification and dehumidification
   4.4. State the observations to be made
   4.5. Understand the P-H diagram for given refrigerant
   4.6. Calculate the COP of test rig

5. Vacuumization and Charging of refrigeration system
   5.1. Know the reason for removal of air from refrigeration system
   5.2. Evacuate the given system using vacuum pump
   5.3. Apply leak tests before charging
   5.4. State the need of correct amount of refrigerant for effective performance
   5.5. Understand the procedure of charging
   5.6. Check the quantity of fluid charged(By weight difference)

6. Servicing & Maintenance of R & AC Equipment
   6.1. Prepare the maintenance schedule for domestic refrigeration system
   6.2. Apply leak detection methods for refrigerant leaks
   6.3. Familiarise the symptoms of faults in refrigerant system and their remedies.

7. Understand the working of solar radiation-\

8. Study of the following solar appliance
   8.1. Solar heaters
   8.2. Solar still

9. Study of the following wind mills
   9.1. Horizontal axis wind mill
   9.2. Vertical axis wind mill

10. Study wind measuring instruments

11. Study and performance of commonly used Bio gas plants

Course contents

1. Determination of COP of Vapour Compression cycle test rig.
2. Determination of COP of domestic refrigerator test rig.
3. Determination of COP of water cooler test rig.
4. Conduct a performance test on given air-conditioning system and evaluate C.O.P. of the system.
5. Vacuumization & Charging, pressure testing of given refrigeration system.
6. Servicing and maintenance of R&AC equipment--trouble shooting and leak detection of
   6.1. Domestic refrigerator
   6.2. Window/split air conditioner
7. Study and performance of Pyranometer
8. Study of solar appliances- Heaters- Stills
9. Study of wind mills-
10. Study of wind speed measuring instruments
11. Study of Bio gas plants-KVIC, Janatha, Deenabandhu plants

Life Skills

Subject Title : Life Skills
Subject Code : M-508
Periods/ Week : 03
Periods/Semester : 45

TIME SCHEDULE

Sl No.	UNITS	No. of periods Allotted		
		Explanation	Activities	Total
1.	ATTITUDE	1	3	4
2.	ADAPTABILITY	1	3	4
3.	GOAL SETTING	1	3	4
4.	MOTIVATION	1	3	4
5.	TIME MANAGEMENT	1	3	4
6.	CRITICAL THINKING	2	3	5
7.	CREATIVITY	1	3	4
8.	PROBLEM SOLVING	1	3	4
9.	TEAM WORK	1	3	4
10.	LEADERSHIP	1	3	4
11.	STRESS MANAGEMENT	1	3	4
TOTAL		12	33	45

Note: No Written Examination; The total 45 hours are to be considered as Theory hours.
Marks: Internal – 40; External – 60

OBJECTIVES:
Upon the completion of this course, the student shall be able to

1.0 Understand the concept of Attitude
- 1.1 Define 'Attitude'
- 1.2 Explain the importance of Attitude
- 1.3 Distinguish between Positive and Negative Attitudes
- 1.4 Life Response: Need for change of Attitude
- 1.5 Positive Attitude: Key to success in Personal and Professional Lives

2.0 Understand the concept of Adaptability
- 2.1 Define the term 'Adaptability'
- 2.2 Explain the concept of Adaptability
- 2.3 Advantages of Adaptability
- 2.4 Disadvantages of Lack of Adaptability
- 2.5 Need for positive response to change

3.0 Understand the concept of Goal setting

3.1 Define the terms'Goal' and 'Goal Setting'
3.2 Explain the significance of Goal setting&Long and Short term goals
3.3 Explain the following concepts
a) Wish b) Dream c) Goal
3.4 Explain the reasons for and consequences of not setting goals
3.5 The SMART features in Goal setting

4.0 Understand the concept of Motivation

4.1 Define 'Motivation' ; Inspiration Vs Motivation
4.2 Importance of motivation in Goal setting
4.3 Distinguish between Internal (Self) Motivation and External Motivation
4.4 De-motivating Factors and how to overcome them
4.5 Motivating oneself and others

5.0 Understand Time Management skills

5.1 Define 'Time Management'.
5.2 Comprehend the significance of Time Management.
5.3 Explain the Time Quadrant
5.4 Common Time wasters and how to overcome them.
5.5 How to meet deadlines and targets within time

6.0 Understand Critical Thinking

6.1 Define"Critical Thinking",
6.2 Understand the importance of Critical Thinking
6.3 Distinguish between facts and opinions (assumptions)
6.4 Inculcating different perspectives
6.5 Developing Reasoning abilities and form sound judgments

7.0 Understand Creativity

7.1 Understand the importance of and need for creative ideas
7.2 Distinguish between Linear Thinking and Lateral Thinking
7.3 Distinctive qualities of creative people
7.4 Unusual or creative use of familiar objects
7.5 Creative ways of solving problems

8.0 Understand Problem Solving

8.1. Define the concept of Problem solving
8.2 Viewing the problems as challenges
8.3 Different steps in solving a problem
8.4 Selecting the best solution to solve a problem
8.5 Lateral thinking in Problem solving

9.0 Understand Team Work

9.1 Define Team work
9.2 Develop Team skills
9.3 Advantages of team work
9.4 Understand responsibilities as a team player
9.5 Problems of working in a team and possible solutions

10.0 Understand Leadership

10.1 Define Leadership
10.2 Identify Leadership qualities
10.3 Analyze one's strengths and limitations as a leader
10.4 Types of Leadership: Autocratic and Democratic
10.5 Leadership by example

11.0 Understand Stress Management

11.1 Define Stress
11.2 Explain the causes of stress
11.3 Learn Stress Management skills
11.4 Need for positive thinking and self esteem
11.5 Practice Stress Management strategies

Workshop Practice-III

Subject Title : Workshop Practice-III
Subject Code : M-509
Periods/Week : 04
Periods per Semester : 60

S. No.	Name of Experiment	No of periods allotted
1	**Milling**	
	1.1 T-slot cutting on milling machine.	6
	1.2 Spur gear cutting on milling machine	6
	1.3 Helical gear cutting on milling machine	6
2	**Slotting**	
	2.1 Key way cutting by slotting machine	6
	2.2 Indexing method in slotting machine	6
3	**Planning**	
	3.1 preparation of plain surface with planning machine	6
4	**Grinding**	
	4.1 preparation of rectangular block of precise dimensions by using surface grinding machine	6
	4.2 Sharpening of lathe tools by tool and cutter grinder	3
	4.3 sharpening of milling cutter by tool and cutter grinder	3
	4.4 Sharpening of drill bit by using tool and cutter grinder	3
5	**Metrology**	
	5.1 Linear Measurement by Slip gauges	3
	5.2 Angular Measurement by Sine Bar	3
	5.3 Gear Tooth Measurement using Gear Tooth Caliper	3

On the completion of the course the student should be able to

1) Milling

a) Get hands on experience on Milling of Spur, Helical gears and T-slots

2) Slotting

a) Get hands on experience on Key way cutting on slotting with indexing attachment

3) Planning

a) Get hands on experience on Planningof flat surfaces using a planer

4) Grinding

a) Get hands on experience on surface grinder

b) Get hands on experience on Tool and cutter grinder

5) Metrology

a) Get hands on experience on use of slip gauges

b) Get hands on experience on use of Sinebar

c) Get hands on experience on use of Gear tooth vernier

COURSE CONTENTS

1) **Milling**
   a) T-slot cutting on milling machine.
   b) Spur gear
   c) Helical gear cutting on milling machine

2) Slotting
   a) Key way cutting by slotting machine.
   b) Indexing method in slotting machine

3) Planning
   a) preparation ofplain surfacewith planning machine

4) Grinding
   a) Preparation of rectangular block of precise dimensions by using surface grinding machine.
   b) Sharpening of lathe tools, milling cutter and drill bit by using tool and cutter grinder.

5) Metrology
   a) Linear measurement by slip gauges
   b) Angular measurement by Sine bar
   c) Gear Tooth Measurement using Gear Tooth Calliper

C-16-VI SEMESTER
M-601 INDUSTRIAL TRAINING

Scheme of evaluation:

S.No	Subject	Duration	Items	Max Marks	Remarks
1	M-601 Practical Training in the Industry	6 Months	1.First Assessment (at the end of 3rd month)	100	
			2. Second Assessment (at the end of 6th month)	100	
			3.Training report i) Log Book ii) Report	30 30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks are 50%.A candidate failing to secure the minimum marks should complete it at his own expenses.

During Industrial training the candidate shall put in a minimum of 90%attendence.

C-16-VI SEMESTER
M-601 INDUSTRIAL TRAINING

OBJECTIVES

On completion of a spell of practical training in a industry, the student will be able to

1.0 Know the organizational set up from top executive to workmen level

1.1 Know the function of each department/section

1.2 Know the inter relationship among various department/sections

2.0 Know the various raw materials used as feed stock and their source.

2.1 Understand the various intermediates produced and their further processing and / or waste disposal.

2.2 Know the final products, its composition and its commercial importance's, uses and applications.

3.0 Understand the various stages involved in processing, sequential arrangement of different equipment.

3.1 Draw the flow diagram, detail flow diagram of each process

3.2 Understand the arrangement of various equipment and machinery in systematic manner in a less possible area of site.

4.0 Know the various analytical methods used in the quality control department

4.1 Understand the experimental methods to find out the quality of the product

4.2 Understand various tools, instruments used for quality checking.

5.0 Know the trouble shooting in process operation

5.1 Know preventive precautions of each equipment in the plant.

5.2 Startup and shut down procedures for the equipment and plant.

6.0 Know the importance of safety in industries

6.1 Understand the safety about personnel protection, equipment protection

6.2 Know the usage of various safety devices

6.3 Precautionary measures to be taken.

7.0 Know the various pollutants emitted from the plant.

7.1 Understand effects of pollutants.

7.2 Understand treatment method and disposal.

7.3 Know the effective methods pollution control.

COURSE CONTENTS

1. Organizational set up
2. Raw materials, intermediates and end products
3. Process descriptions (Process flow diagrams and line tracing, detailed flow diagrams etc.)
4. Quality control of raw materials, intermediates and end products
5. Operational troubles and preventive measures
6. Safety aspects (personnel, equipment etc.)
7. Pollution control

INDUSTRIAL TRAINING SCHEME

VI SEMESTER

1. A candidate shall be assessed twice in the spell of industrial training i.e. at the end of third month and finally before he/she completes the industrial training
2. The assessment shall be carried out by a committee comprising of
   (a) A representative of the Industry where the candidate is undergoing training
   (b) A staff member of the concerned section of the polytechnic.
3. The assessment at the end of the third month and the end of training shall each carry 100 marks for the progress made during the corresponding period of training.
4. The remaining 100 marks are allotted as follows:

   For the training report (Record) 30 marks,

   For maintenance of log book 30 marks

   For seminar 40 marks.

   These are to be evaluated at the institution at the end of training by a committee consisting following staff members

(1) Head of Section.
(2) External Examiner preferably from Industry
(3) Staff member who assessed the student during the Industrial Training.

5. The progress made during the end of assessment will be evaluated on the basis of the following parameters.

ASSESSMENT SCHEME

S. No.	Name of the Parameter	Max. Marks Allotted for each Parameter
1.	Attendance and punctuality	05
2.	Familiarity with Technical terms	06
3.	Familiarity with tools and material	10
4.	Attitude towards job	07
5.	Manual skills	04
6.	Application of knowledge	10
7.	Problem solving skills	10
8.	Comprehension and observation	04
9.	Safety and Environmental consciousness	03
10.	Human relations	04
11.	Ability to communicate	06
12.	Supervising ability	10
13.	General conduct during the period	06
14.	Maintenance of dairy	15
	Total	**100**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
FIRST YEAR

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE- 101	English	3	-	90	3			100
CE-102	Mathematics - I	5	-	150	3			100
CE-103	Engineering Physics	4	-	120	3			100
CE-104	Engineering Chemistry & Environmental Studies	4	-	120	3			100
CE-105	Engineering Mechanics	5	-	150	3			100
CE-106	Surveying-I	3	-	90	3			100
PRACTICAL:								
CE- 107	Engineering Drawing	-	6	180	3			100
CE-108	Surveying - I Practice & Plotting	-	6 (4+2)	180	3			100
CE-109	109-A Physics Lab 109-B Chemistry Lab	-	3	90	3 (1.5+1.5)			100 (50+50)
CE- 110	Computer Fundamentals Practice	-	3	90	3			100
	TOTAL	24	18	1260				1000

ENGLISH
(Common to all branches)

Subject Title : ENGLISH
Subject Code : CE - 101
Periods per Week : 03
Periods per Year : 90

TIME SCHEDULE

Sl No	Major Topics	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary	5	13	1	1
2	Grammar	30	31	7	1
3	Reading	10	10	-	1
4	Writing	30	40	-	4
5	English in Action	15	16	2	1
		90	110	10	08

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-14 Curriculum the focus is on the special English needs of technician studies and training. This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing repots, giving instructions and interpreting graphics is of great importance. Therefore the curriculum C-14 focuses on improving communicative abilities equipping the students to become industry-ready and employable.

On completion of this course the student shall be able to:

1.0 Build their vocabulary in the direction of their future needs
2.0 Learn various grammatical structures
3.0 Read and comprehend English and understand the details and draw inferences
4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs

1.1 Locate words, learn spellings, understand meanings
1.2 Pronounce words intelligibly
1.3 Find synonyms and antonyms
1.4 Use affixation
1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures

2.1 Identify and use nouns
2.2 Identify and use pronouns
2.3 Use the present tense
2.4 Use the past tense
2.5 Use the future tense
2.6 Identify and use adjectives
2.7 Identify and use adverbs

2.8 Use prepositions
2.9 Use linkers
2.10 State basic sentence structures
2.11 Construct different types of sentences
2.12 Frame questions to elicit information
2.13 Frame questions for conformation
2.14 Use active voice
2.15 Use passive voice
2.16 Use direct speech
2.17 Use indirect speech
2.18 Identify and correct errors

3.0 Read and comprehend English
3.1 Identify the main ideas
3.2 Identify the specific details
3.3 Draw inferences
3.4 Give contextual meanings of the words
3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)
4.1 Identify components of a good paragraph
4.2 Write types of paragraphs
4.3 Distinguish between formal and informal letters
4.4 Write personal letters
4.5 Write leave letters
4.6 Write official letters
4.7 Write letters of complaints
4.8 Prepare a resume
4.9 Write a cover letter
4.10 Write short messages
4.11 Report incidents
4.12 Report experiments
4.13 Report Industrial visits
4.14 Write work done statements
4.15 Write maintenance reports
4.16 Make notes using Cue method and Mapping method
4.17 Summarize Paragraphs
4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

5.0 Practice spoken communication suited to various situations.
5.1 Use appropriate expressions to greet and take leave
5.2 Use proper expressions to make requests
5.3 Use apt expressions for asking and giving directions
5.4 Use suitable expressions to seek and offer suggestions
5.5 Use suitable expressions to state intentions
5.6 Use suitable expressions to state feelings
5.7 Use appropriate expressions to state agreement and disagreement
5.8 Use proper expressions to make complaints
5.9 Use suitable expressions to express obligations

REFERENCE BOOKS

1. Essential English Grammar (Intermediate Level) Raymond Murphy
2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary) Santanu Sinha Chaudhuri
3. Grammar Builder (Entire Series) Oxford University Press
4. High School English Grammar (Revised Edition) Wren and Martin
5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill) John Langan, Paul Langan
6. Word Power Made Easy Norman Lewis
7. Spoken English Shashi Kumar and Dhamija
8. The textbook prepared by the faculty of English of Polytechnics in AP.

ENGINEERING MATHEMATICS – I
(Common to all branches)

Subject Title : ENGINEERING MATHEMATICS – I
Subject Code : CE-102
Periods per week : 04
Periods per Semester : 60

TIME SCHEDULE

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
	Unit - I : Algebra	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
1	Logarithms	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	1/2
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0

	Unit III : Co-ordinate Geometry									
13	Straight Lines	4	2	3	1	0	0	0	0	0
14	Circle	4	2	3	1	0	0	0	0	0
15	Conic Sections	5	4	10	0	0	0	0	1	0
Unit – IV : Differential Calculus										
16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
Unit - V : Applications of Differentiation										
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
	Total	92	58	110	7	3	0	2	2 1/2	3 1/2
				Marks	21	9	0	20	25	35

R: Remembering type 41 marks
U: Understanding type 34 marks
App: Application type 35 marks

OBJECTIVES
Upon completion of the course the student shall be able to

UNIT – I

Algebra

1.0 Use Logarithms in engineering calculations

1.1 Define logarithm and list its properties.
1.2 Distinguish natural logarithms and common logarithms.
1.3 Explain the meaning of e and exponential function.
1.4 State logarithm as a function and its graphical representation.
1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

2.1 Define the following fractions of polynomials:
1. Rational,
2. Proper and
3. Improper

2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \frac{f(x)}{(x+a)(x+b)(x+c)}$ $\qquad ii)\quad \frac{f(x)}{(x+a)^2(x+b)(x+c)}$

$iii)\quad \frac{f(x)}{(x^2+a)(x+b)}$ $\qquad iv)\quad \frac{f(x)}{(x+a)(x^2+b)^2}$

3.0 Use Matrices for solving engineering problems

3.1 Define a matrix and order of a matrix.
3.2 State various types of matrices with examples (emphasis on 3rd order square matrices).
3.3 Compute sum, scalar multiplication and product of matrices.
3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.
3.5 Define the transpose of a matrix and write its properties.
3.6 Define symmetric and skew-symmetric matrices.
3.7 Resolve a square matrix into a sum of symmetric and skew- symmetric matrices with examples in all cases.
3.8 Define minor, co-factor of an element of a 3x3 square matrix with examples.
3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.
3.10 Distinguish singular and non-singular matrices.
3.11 Apply the properties of determinants to solve problems.
3.12 Solve system of 3 linear equations in 3 unknowns using Cramer's rule.
3.13 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.
3.14 Compute adjoint and multiplicative inverse of a square matrix.
3.15 Solve system of 3 linear equations in 3 unknowns by matrix inversion method
3.16 State elementary row operations.
3.17 Solve a system of 3 linear equations in 3 unknowns by Gauss- Jordan method

UNIT – II

Trigonometry

4.0 Understand Trigonometric Ratios

4.1 Define trigonometric ratios of any angle.
4.2 List the values of trigonometric ratios at specified values.
4.3 Draw graphs of trigonometric functions
4.4 Explain periodicity of trigonometric functions

5.0 Solve simple problems on Compound Angles

5.1 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B)
5.2 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

5.3 Derive identities like sin(A+B) sin(A-B) = $\sin^2 A - \sin^2 B$ etc.,

5.4 Solve simple problems on compound angles.

6.0 Solve problems using the formulae for Multiple and Sub- multiple Angles

6.1 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.

6.2 Derive useful allied formulas like sinA= (1- cos2A)/2 etc.

6.3 Solve simple problems using the above formulae

7.0 Apply Transformations for solving the problems in Trigonometry

7.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.

7.2 Solve problems by applying these formulae to sum or difference or product of three or more terms.

8.0 Use Inverse Trigonometric Functions for solving engineering problems

8.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

8.2 Define inverses of six trigonometric functions along with their domains and ranges.

8.3 Derive relations between inverse trigonometric functions so that given A= $\sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.

8.4 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x+\cos^{-1} x = \frac{\pi}{2}$ etc.

8.5 Derive formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right), \ where \ x \geq 0, y \geq 0, xy < 1$ etc.,

8.6 Solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

9.1 Explain what is meant by solutions of trigonometric equations and find the general solutions of sin x=k, cos x =k and tan x=k with appropriate examples.

9.2 Solve models of the type a $\sin^2$ x + b sin x +c=0, a cos x + b sin x=c etc., and problems using simple transformations.

10.0 Appreciate Properties of triangles and their solutions

10.1 State sine rule, cosine rule, tangent rule and projection rule.

10.2 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter and sides a, b, c and solve problems.

10.3 List various formulae for the area of a triangle.

10.4 Solve problems using the above formulae.

10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

11.1 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.

11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

12.1 Define complex number, its modulus , conjugate and list their properties.
12.2 Define the operations on complex numbers with examples.
12.3 Define amplitude of a complex number
12.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.
12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT – III

Coordinate Geometry

13.0 Solve the problems on Straight lines

13.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form
13.2 Solve simple problems on the above forms
13.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

14.0 Solve the problems on Circles

14.1 Define locus of a point – circle and its equation.
14.2 Find the equation of a circle given
(i) Center and radius
(ii) Two ends of a diameter
(iii) Centre and a point on the circumference
(iv) Three non collinear points
(v) Centre and tangent
14.3 Write the general equation of a circle and find the centre and radius.
14.4 Write the equation of tangent and normal at a point on the circle.
14.5 Solve the problems to find the equations of tangent and normal.

15.0 Appreciate the properties of Conics in engineering applications

15.1 Define a conic section.
15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.
15.3 Find the equation of a conic when focus, directrix and eccentricity are given
15.4 Describe the properties of Parabola, Ellipse and Hyperbola
15.5 Solve engineering problems in simple cases of Parabola and Ellipse.

UNIT – IV

Differential Calculus

16.0 Use the concepts of Limit and Continuity for solving the problems

16.1 Explain the concept of limit and meaning of $\lim_{x \to a} f(x) = l$ and state the properties of limits.

16.2 Mention the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ (All without proof).

16.3 Solve the problems using the above standard limits

16.4 Evaluate the limits of the type $\lim_{x\to l}\frac{a x^2+b x+c}{\alpha x^2+\beta x+\gamma}$ and $\lim_{x\to\infty}\frac{f(x)}{g(x)}$

16.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

17.0 Appreciate Differentiation and its meaning in engineering situations

17.1 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

17.2 State the significance of derivative in scientific and engineering applications.

17.3 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

17.4 Find the derivatives of simple functions from the first principle .

17.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

17.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

(i) $\sqrt{t^2+\frac{2}{t}}$ **(ii)** $x^2\sin 2x$ **(iii)** $\frac{x}{\sqrt{x^2+1}}$ **(iv)** $\log\left(\sin(\cos x)\right)$.

17.7 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

17.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

17.9 Find the derivatives of hyperbolic functions.

17.10 Explain the procedures for finding the derivatives of implicit function with examples.

17.11 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.

17.12 Explain the concept of finding the higher order derivatives of second and third order with examples.

17.13 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.

17.14 Explain the definition of Homogenous function of degree n

17.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT – V

Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

18.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.

18.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

18.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x) .

18.4 Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

19.0 Understand the Physical Applications of Derivatives

19.1 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

19.2 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

20.0 Use Derivatives to find extreme values of functions

20.1 Define the concept of increasing and decreasing functions.

20.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

20.3 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima.

20.4 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

21.0 Use Derivatives to find Errors and Approximations

21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

COURSE CONTENT

Unit-I

Algebra

1. Logarithms

Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions

Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

$i)$ $\dfrac{f(x)}{(x+a)(x+b)(x+c)}$ $ii)$ $\dfrac{f(x)}{(x+a)^2(x+b)(x+c)}$

$iii)$ $\dfrac{f(x)}{(x^2+a)(x+b)}$ $iv)$ $\dfrac{f(x)}{(x+a)(x^2+b)^2}$

Matrices

3. Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables-Solutions by Cramers's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry

4.Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.

5. Compound angles: Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.

6. Multiple and sub multiple angles: trigonometric ratios of multiple angles 2A,3A and submultiple angle A/2 with problems.

7. Transformations of products into sums or differences and vice versa simple problems

8. Inverse trigonometric functions : definition, domains and ranges-basic properties-problems.

9. Trigonometric equations: concept of a solution, principal value and general solution of trigonometric equations :
   sin x =k , cos x= k, tan x =k.
   Solutions of simple quadratic equations, equations involving usage of transformations-problems.

10. Properties and solutions of triangles: relation between sides and angles of a triangle-sine rule, cosine rule, tangent rule and projection rule-area of a triangle- solving a triangle- problems.

11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.

12. Complex Numbers : Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form(Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III

Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of appoint, Circle, definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points and (v) centre and tangent equation - general equation of a circle - finding center, radius: tangent, normal to circle at a point on it.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms - applications of parabola and ellipse to engineering situations.

UNIT-IV

Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.
17. Concept of derivative- definition (first principle)- different notations-derivatives of elementary functions - problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarthmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, subtangent and subnormal to the curve at any point . Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.
20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

REFERENCE BOOKS

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS
(Common to all branches)

Subject Title : Engineering Physics
Subject Code : CE -103
Periods per week : 04
Total periods per year : 120

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	12	13	1	1
3.	Kinematics	12	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	10	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	14	13	1	1
11.	Modern Physics	10	03	1	-
	Total	**120**	**103**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

1.1 Explain the concept of Units
1.2 Define the terms
a) Physical quantity, b) Fundamental physical quantities and
c) Derived physical quantities
1.3 Define unit
1.4 Define fundamental units and derived units
1.5 State SI units with symbols
1.6 State Multiples and submultiples in SI system
1.7 State Rules of writing S.I. units
1.8 State advantages of SI units
1.9 Define Dimensions
1.10 Write Dimensional formulae
1.11 Derive dimensional formulae of physical quantities
1.12 List dimensional constants and dimensionless quantities

1.13 State the principle of Homogeneity of Dimensions
1.14 State the applications of Dimensional analysis
1.15 State the limitations of dimensional analysis

2.0 Understand the concept of Elements of Vectors

2.1 Explain the concept of Vectors
2.2 Define Scalar and Vector quantities
2.3 Give examples for scalar and vector quantities
2.4 Represent vectors graphically
2.5 Classify the Vectors
2.6 Resolve the vectors
2.7 Determine the Resultant of a vector by component method
2.8 Represent a vector in space using unit vectors (I, j, k)
2.9 State triangle law of addition of vectors
2.10 State parallelogram law of addition of vectors
2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
2.12 Derive expression for magnitude and direction of resultant of two vectors
2.13 State polygon law of addition of vectors
2.14 Explain subtraction of vectors
2.15 Define Dot product of two vectors with examples (Work done, Power)
2.16 Mention the properties of Dot product
2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
2.18 Mention the properties of Cross product.
2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

3.1 Recapitulate the equations of motion in a straight line
3.2 Define acceleration due to gravity
3.3 Derive expressions for
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of
3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.5 Define projectile motion with examples
3.6 Explain Horizontal projection
3.7 Derive an expression for the path of a projectile in horizontal projection
3.8 Explain oblique projection
3.9 Derive an expression for the path of projectile in oblique projection
3.10 Derive formulae for
a)Horizontal Range, b)Maximum range of a projectile in oblique projection
3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

4.1 Define friction
4.2 Classify the types of friction
4.3 Explain the concept of Normal reaction
4.4 State the laws of friction
4.5 Define coefficients of friction
4.6 Explain the Angle of friction
4.7 Derive an expression for acceleration of a body on a rough horizontal surface
4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface

4.9 Define Angle of repose
4.10 Derive an expressions for acceleration of a body on a smooth inclined plane (up and down)
4.11 Derive an expressions for acceleration of a body on a rough inclined plane (up and down)
4.12 List the Advantages and Disadvantages of friction
4.13 Mention the methods of minimizing friction
4.14 Solve the related numerical problems

5.0 Understand the concept of Work, Power, and Energy

5.1 Define work
5.2 State SI units and dimensional formula for work
5.3 Define power
5.4 State SI units and dimensional formula for power
5.5 Define energy
5.6 State SI units and dimensional formula for energy
5.7 Define potential energy
5.8 Derive the expression for Potential energy with examples
5.9 Define kinetic energy
5.10 Derive the expression for kinetic energy with examples
5.11 State the Work- Energy theorem
5.12 Explain the relation between Kinetic energy and momentum
5.13 State the law of conservation of energy
5.14 Verify the law of conversion of energy in the case of a freely falling body
5.15 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

6.1 Define Simple harmonic motion
6.2 State the conditions of Simple harmonic motion
6.3 Give examples for Simple harmonic motion
6.4 Show that the tip of the projection of a body moving in circular path with uniform speed is SHM
6.5 Derive expression for displacement
6.6 Derive expression for velocity
6.7 Derive expression for acceleration
6.8 Derive expression for Time period and frequency of S H M
6.9 Define phase of S H M
6.10 Derive expression for Time period of simple pendulum
6.11 State the laws of simple pendulum
6.12 State the laws of Seconds pendulum
6.13 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

7.1 Explain the concept of expansion of gases
7.2 Explain Boyle' s law
7.3 State Charles law in terms of absolute temperature
7.4 Define absolute zero temperature
7.5 Explain absolute scale of temperature
7.6 Define ideal gas
7.7 Derive ideal gas equation
7.8 Define gas constant and Universal gas constant

7.9 Explain why universal gas constant is same for all gases
7.10 State SI unit of universal gas constant
7.11 Calculate the value of universal gas constant
7.12 State the gas equation in terms of density
7.13 Distinguish between r and R
7.14 Explain Isothermal process with the help of P-V and T-Ø diagram
7.15 Explain adiabatic process with the help of P-V and T-Ø diagram
7.16 Distinguish between isothermal and adiabatic process
7.17 State first and second laws of thermodynamics
7.18 Define specific heats & molar specific heats of a gas
7.19 Derive the relation $C_p - C_v = R$
7.20 Solve the related numerical problems

8.0 Understand the concept of Sound

8.1 Define the term sound
8.2 Explain longitudinal and transverse wave motion
8.3 Distinguish between musical sound and noise
8.4 Explain noise pollution and state SI unit for noise
8.5 Explain causes of noise pollution
8.6 Explain effects of noise pollution
8.7 Explain methods of minimizing noise pollution
8.8 Explain the phenomenon of beats
8.9 List the applications of beats
8.10 Define Doppler effect
8.11 List the Applications of Doppler effect
8.12 Explain reverberation and reverberation time
8.13 Write Sabine's formula
8.14 Explain echoes
8.15 State conditions of good auditorium
8.16 Solve the related numerical problems

9.0 Understand the properties of matter

9.1 Define the term Elasticity
9.2 Define the terms stress and strain
9.3 State the units and dimensional formulae for stress and strain
9.4 State the Hooke's law
9.5 Define the surface tension
9.6 Explain Surface tension with reference to molecular theory
9.7 Define angle of contact
9.8 Define the capillarity
9.9 Write the formula for surface tension based on capilarity
9.10 Explain the concept of Viscosity
9.11 Provide examples for surface tension and Viscosity
9.12 State Newton's formula for viscous force
9.13 Define co-efficient of viscosity
9.14 Explain the effect of temperature on viscosity of liquids and gases
9.15 State Poiseulle's equation for Co-efficient of viscosity
9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

10.1 Explain the concept of Electricity
10.2 State the Ohm's law
10.3 Explain the Ohm's law
10.4 Define specific resistance, conductance and their units
10.5 State Kichoff's laws
10.6 Explain Kichoff's laws
10.7 Describe Wheatstone's bridge with legible sketch
10.8 Derive expression for balancing condition of Wheatstone's bridge
10.9 Describe Meter Bridge with legible sketch
10.10 Write the formula in Meter Bridge to determine specific resistance
10.11 Explain the concept of magnetism
10.12 State the Coulomb's inverse square law of magnetism
10.13 Define magnetic field and magnetic lines of force
10.14 State the Magnetic induction field strength-units and dimensions
10.15 Derive Magnetic induction field strength at a point on the axial line
10.16 Describe the moment of couple on a bar magnet placed in a uniform magnetic field
10.17 Derive Magnetic induction field strength at a point on the equatorial line
10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

11.1 Explain Photo-electric effect
11.2 Write Einstein's photoelectric equation
11.3 State laws of photoelectric effect
11.4 Explain the Working of photoelectric cell
11.5 List the Applications of photoelectric effect
11.6 Recapitulate refraction of light and its laws
11.7 Define critical angle
11.8 Explain the Total Internal Reflection
11.9 Explain the principle and working of Optical Fiber
11.10 Mention types of optical fibbers
11.11 List the applications of Optical Fiber
11.12 Define super conductor and superconductivity
11.13 List the examples of superconducting materials
11.14 List the applications of superconductors

COURSE CONTENT

1. Units and Dimensions:

Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units-Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Advantages and limitations of Dimensional analysis- - Problems.

2. Elements of Vectors:

Scalars and Vectors –Types of vectors(Proper Vector, Null Vector, Unit Vector, Equal , Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors–Subtraction of vectors- Dot and Cross products of vectors-Problems

3. Kinematics

Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range - problems

4. Friction

Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose- Angle of friction— Motion of a body over a horizontal surface- smooth inclined plane- rough inclined plane- Advantages and disadvantages of friction- Methods of reducing friction – Problems

5. Work, Power and Energy

Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy-Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems

6. Simple Hormonic Motion

Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum- Problems

7. Heat and Thermodynamics

Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between r and R- Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats of a gas - Problems

8. Sound

Sound- Nature of sound- Types of wave motion - usical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Condition of good auditorium- Problems

9. **Properties of matter**

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law- Definition of surface tension-Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseulle's equation for Co-efficient of viscosity- The related numerical problems

10. Electricity & Magnetism

Ohm's law and explanation- Specific resistance- Kirchoff's laws- Wheatstone's bridge- Coulomb's inverse square law magnetic field- magnetic lines of force-Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line –problems.

11. Modern Physics

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect- Total internal reflection- fiber optics- -principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- concepts of superconductivity - applications

REFERENCE BOOKS

1. Intermediate physics Volume-I — Deepthi
2. Unified physics Volume 1,2,3 and 4 — Dr.S.L Guptha and Sanjeev Guptha
3. Text book of physics Volume I — Resnick & Holiday
4. Text book of applied physics — Dhanpath Roy
5. Fibre optics — D.A Hill

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	12	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	10	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	14	13	0	1	0	0	1	0
11.	Modern Physics	10	03	1	0	0	0	0	0
	Total	**120**	**110**	**3**	**5**	**2**	**2**	**5**	**1**

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES
(Common to all branches)

Subject Title :ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES
Subject Code :CE -104
Periods per week :04
Total periods per year:120

Blue Print

S.No	Major topic	No of Periods	Weightage of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
A. ENGINEERING CHEMISTRY										
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
B. ENVIRONMENTAL STUDIES		18	16	1	1	0	0	1	0	
TOTAL		120	110	6	2	2	3	3 1/2	1 1/2	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A. ENGINEERING CHEMISTRY

1.0 Understand the concept of Atomic structure

1.1 Explain the fundamental particles of an atom like electron, proton and neutron etc.,

1.2 Explain the concept of atomic number and mass number

1.3 State the Postulates of Bohr's atomic theory and its limitations

1.4 Explain the concept of Quantum numbers with examples

1.5 Explain 1.Aufbau's principle, 2.Hund's rule and 3.Pauli's exclusion principle with respect to electron stability

1.6 Define Orbital in an atomic structure

1.7 Draw the shapes of s, p and d Orbitals in an atomic structure

1.8 Distinguish between Orbit and Orbital
1.9 Write the electronic configuration of elements up to atomic number 30
1.10 Explain the significance of chemical bonding
1.11 Explain the Postulates of Electronic theory of valance
1.12 Define the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic
1.13 Explain the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic
1.14 Explain bond formation in NaCl and MgO
1.15 List Properties of Ionic compounds
1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method
1.17 List Properties of Covalent compounds
1.18 Explain Metallic bond with Electron sea model theory
1.18 Define the terms 1.Oxidation, 2.Reduction and 3.Oxidation number
1.19 Calculate the Oxidation Number
1.20 Differentiate between Oxidation Number and Valence

2.0 Calculate Molarity, Molality and Normality of given Solution

2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent
2.2 Classify solutions based on physical state and solubility
2.3 Define mole
2.4 Explain, with examples, the 'Mole concept'
2.5 Define the terms 1. Atomic weight, 2. Molecular weight and 3. Equivalent weight
2.6 Calculate Molecular weight and Equivalent weight of given Acids, Bases and Salts
2.7 Define 1.Molarity, 2. Molalty and 3.Normality of solutions
2.8 Explain with examples Normality
2.9 Solve Numerical problems on Mole, Molarity and Normality

3.0 Understand the concepts of Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases
3.2 State the limitations of Arrhenius theory of Acids and Bases
3.3 Explain Bronsted – Lowry theory of acids bases
3.4 State the limitations of Bronsted – Lowry theory of acids bases
3.5 Explain Lewis theory of acids and bases
3.6 State the limitations Lewis theory of acids and bases
3.7 Explain the Ionic product of water
3.8 Define pH and explain Sorenson scale
3.9 Solve the Numerical problems on pH (Strong Acids and Bases)
3.10 Define buffer solution
3.11 Give the at least three examples foe buffer solutions
3.12 State the applications of buffer solution

4. 0 Understand the Principles of Metallurgy

4.1 List at least eight Characteristics of Metals
4.2 Distinguish between Metals and Non Metals
4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4. Flux and 5. Slag
4.4 Describe the methods of concentration of ore like 1.Hand picking,2. Levigation, and 3. Froth
Floatation
4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.

4.6 Explain the purification of Metals by Electrolytic Refining
4.7 Define an Alloy
4.8 Write the Composition of the following alloys:1.Brass, 2.German silver, and Nichrome
4.9 List the uses of following Alloys: Brass, German silver, Nichrome

5.0 Understand the concepts of Electrochemistry
5.1 Define the terms1. conductor, 2. Insulator, 3.Electrolyte and 4.Non – electrolyte
5.2 Distinguish between metallic conduction and Electrolytic conduction
5.3 Explain Arrhenius theory of electrolytic dissociation
5.4 Explain electrolysis by taking example fused NaCl
5.5 Explain Faraday's laws of electrolysis
5.6 Define 1.Chemical equivalent and 2.Electrochemical equivalent
5.7 Solve the Numerical problems based on Faraday's laws of electrolysis
5.8 Define Galvanic cell
5.9 Explain the construction and working of Galvanic cell
5.10 Distinguish between electrolytic cell and galvanic cell
5.11 Explain the standard electrode potentials
5.12 Explain the electrochemical series and its significance
5.13 Explain the emf of a cell
5.14 Solve the numerical problems on emf of cell

6.0 Understand the concept of Corrosion
6.1 Define the term corrosion
6.2 Explain the Factors influencing the rate of corrosion
6.3 Explain the concept of electrochemical theory of corrosion
6.4 Describe the formation of a) composition cells, b) stress cells c) concentration cells
6.5 Explain the mechanism of rusting of iron
6.6 Explain the methods of prevention of corrosion: a) Protective coatings
b) Cathodic protection (Sacrificial anode process and Impressed – voltage process)

7. 0 Understand the concept of Water Technology
7.1 State the various Sources of water like Surface and sub surface sources
7.2 Define the terms soft water and hard water with respect to soap consumption
7.3 Define the term of hardness of water
7.4 Explain the various types of hardness of water like temporary and permanent hardness; and carbonate and bicarbonate hardness of water.
7.5 List the usual compounds causing hardness (with Formulae)
7.6 State the disadvantages of using hard water in industries
7.7 Define Degree of hardness, units of hardness (mg/L)
7.8 Explain the methods of softening of hard water: a) Ion-Exchange process, b)Reverse osmosis process(RO)
7.9 List the advantages of RO
7.10 State three essential qualities of drinking water like
1).Safety, 2). Economy and 3)..Aesthetic

8.0 Understand the concepts of Polymers
8.1 Explain the concept of polymerisation

8.2 Describe the methods of polymerisation a) addition polymerisation of Ethylene b) condensation polymerisation of phenol and formaldehyde (Only flow chart i.e. without chemical equations)
8.3 Define the term plastic
8.4 Classify the plastics with examples
8.5 Distinguish between thermo and thermosetting plastics
8.6 List the Characteristics of plastics
8.7 State the advantages of plastics over traditional materials
8.8 State the disadvantages of using plastics.
8.9 Explain the methods of preparation of the following plastics:
1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde
8.9 Explain the uses of the following plastics:
1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde
8.10 Define the term natural rubber
8.11 State the structural formula of Natural rubber
8.12 Explain the processing of Natural rubber from latex
8.13 List the Characteristics of natural rubber
8.14 Explain the process of Vulcanization
8.15 List the Characteristics of Vulcanized rubber
8.16 Define the term Elastomer
8.17 Describe the preparation of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber
8.18 List the uses of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber

9.0 Understand the concepts of Fuels

9.1 Define the term fuel
9.2 Classify the fuels based on physical state – solid, liquid and gaseous fuels,
9.3 Classify the fuels based on occurrence- primary and secondary fuels
9.4 List the characteristics of good fuel
9.5 State the composition and uses of gaseous fuels:
a) water gas, b) producer gas, c) natural gas, d) coal gas, e) Bio gas and f) acetylene

B. ENVIRONMENTAL STUDIES

1.1 Define the term environment
1.2 Explain the scope and importance of environmental studies
1.3 Explain the following terms 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere, 5)Pollutant, 6).Pollution, 7).Contaminant receptor - sink, particulates, dissolved oxygen, 8).Threshold limit value, 9).BOD, and 10).COD
1.4 Explain the growing energy needs
1.5 State the differences between renewable and non renewable energy sources- alternative energy sources.
1.6 Define an Ecosystem- biotic component, abiotic component and energy component,
1.7 Define the terms:
1).Producers, 2).Consumers and 3).Decomposers with examples.
1.8 Explain biodiversity and threats to biodiversity
1.9 Define air pollution
1.10 Classify the air pollutants- based on origin and state of matter
1.11 Explain the causes of air pollution

1.12 Explain the use and over exploitation of forest resources and deforestation
1.13 Explain the effects of air pollution on human beings, plants and animals
1.14 Explain the green house effect - ozone layer depletion and acid rain
1.15 Explain the methods of control of air pollution
1.16 Define water pollution
1.17 Explain the causes of water pollution
1.18 Explain the effects of water pollution on living and non living things
1.19 Understand the methods of control of water pollution.

COURSE CONTENT

A.ENGINEERING CHEMISTRY

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers - Aufbau principle - Hand's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds – Metallic bond

Oxidation-Reduction: Concepts of Oxidation-Reduction, Oxidation Number-calculations, differences between Oxidation Number and Valency

2. Solutions

Introduction-concentration methods – Mole concept, Molarity, Normality, Equivalent weights, Numerical problems on Mole, Molarity and Normality

3. Acids and Bases

Introduction – theories of acids and bases and limitations – Arrhenius theory-Bronsted –Lowry theory – Lewis acid base theory – Ionic product of water – pH and related numerical problems – buffer solutions –Applications.

4. Principles of Metallurgy

Characteristics of Metals and distinctions between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. Electrochemistry

Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series –emf and numerical problems on emf of a cell

6. Water technology

Introduction –soft and hard water – causes of hardness – types of hardness –disadvantages of hard water – degree of hardness (ppm) – softening methods – permutit process – ion exchange process – numerical problems related to degree of hardness – drinking water – municipal treatment of water for drinking purpose – Osmosis, Reverse Osmosis - advantages of Reverse osmosis

7. Introduction - factors influencing corrosion - electrochemical theory of corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics – preparation and uses of the following plastics: 1. Polytehene 2. PVC 3. Teflon 4. Polystyrene 5. Urea formaldehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers – Butyl rubber, Buna-s, Neoprene rubber and their uses.

9. Fuels

Definition and classification of fuels – characteristics of good fuel - composition and uses of gaseous fuels.

B. ENVIRONMENTAL STUDIES

Introduction – environment –scope and importance of environmental studies important terms – renewable and non renewable energy sources – Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Biodiversity.

air pollution - causes-Effects – forest resources : uses and over exploitation, deforestation, acid rain, green house effect –ozone depletion – control of air pollution – Water pollution – causes – effects – control measures,

REFERENCE BOOKS

1. Intermediate chemistry Vol 1&2 — Telugu Acedemy
2. Intermediate chemistry Vol 1&2 — Vikram Publishers
3. Intermediate chemistry Vol 1&2 — Vignan Publishers & Deepthi Publishers
4. Engineering Chemistry — Jain & Jain
5. Engineering Chemistry — O.P. Agarwal, Hi-Tech.
6. Engineering Chemistry — Sharma
7. Engineering Chemistry — A.K. De

ENGINEERING MECHANICS

Subject Title : Engineering Mechanics
Subject Code : CE-105
Periods/Week : 05
Periods/Semester : 150

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Type
1.	Introduction	10	03	01	---
2.	Forces & Moments	40	26	02	02
3.	Centroid	25	16	02	01
4.	Moment of Inertia	35	26	02	02
5.	Simple Stresses and Strains	40	39	03	03
	Total	150	110	10	08

OBJECTIVES
Upon completion of the course the student shall be able to

1.0 Understand the basic concepts of Engineering Mechanics
1.1 Define Mechanics and Engineering Mechanics
1.2 State the applications of Engineering Mechanics
1.3 State the branches of Engineering Mechanics
1.3 Define the terms 1.Statics, 2.Dynamics, 3.Kinetics and 4.Kinematics
1.4 State the systems of measurements and Units
1.5 State S.I and M.K.S units of physical quantities used in Civil Engineering

2.0 Understand the concept Equilibrium of Co-Planner forces
2.1 Define the following terms:
1. Force,
2. Moment,
3. Resultant,
4. Equilibrium of forces,
5. Equilibrant and
6. Moment of a couple.

2.2 Distinguish between
2.2.1 Scalar and Vector quantities,
2.2.2 Co-planar and non-co-planar forces,
2.2.3 Parallel and non-parallel forces and

2.2.4 Like and unlike parallel forces.

2.3 Compute the resultant of two co-planar forces acting at a point by

2.3.1 Law of parallelogram of forces and

2.3.2 Triangle law of forces

2.4 Explain 'Lami's Theorem'.

2.41 Solve simple problems using Lami's Theorem

2.5 Solve problems on computation of the resultant of a system of coplanar concurrent forces by

2.5.1 Law of polygon of forces and

2.5.2 Resolution of forces

2.6. Solve problems on computation of the resultant of a system of coplanar parallel forces.

2.7. Explain the properties of a couple.

2.8. State the conditions of equilibrium of rigid body subjected to a number of co- planar forces.

2.8.1. Determine resultant of co-planar concurrent forces by analytical methods.

2.9 List various types of supports (like Simply support, fixed support, hinged support, roller support)

2.10 List various types of beams (like simply supported beams, cantilever, fixed beams, over hanging beams, continuous beams)

2.11 List various types of loading (like point load, uniformly distributed load, uniformly varying load

2.12 To determine support reactions for simply supported beams with point loads and Uniformly distributed loading

3.0 Understand the Centroid

3.1 Define Centroid and Centre of gravity

3.2 Distinguish between Centroid and Centre of gravity

3.3 State the need for finding the Centroid and Centre of gravity for various engineering applications.

3.4 Calculate the positions of Centroid for simple plane figures from first principles

3.5 Explain the method of determining the Centroid by 'Method of moments'.

3.6 Determine the position of Centroid of standard sections-T, L, I, Channel section, Z section, unsymmetrical I section

3.7 Determine the position of Centroid of built up sections consisting of RSJ'S and flange plates and Plane figures having hollow portions

4.0 Compute the Moment of Inertia and radius of gyration

4.1 Define Moment of Inertia (MI), Polar Moment of Inertia, Radius of gyration

4.2 State the necessity of finding Moment of Inertia for various engineering applications

4.3 Determine Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section, unsymmetrical I section

4.4 State 1. Parallel axes theorem and 2. Perpendicular axes theorem to determine MI

4.5 Determine MI of standard sections by applying parallel axes theorem.

4.6 Determine MI of built-up sections by applying parallel axes theorem.

4.7 Calculate radius of gyration of standard sections.

4.8 Determine the polar M.I for solid and hollow circular section applying perpendicular axes theorem.

5.0 Calculate the simple Stresses and Strains in structural materials

5.1 Define the following terms:

1. Stress,
2. Strain,
3. Modulus of Elasticity,
4. Longitudinal Strain,
5. Lateral Strain,
6. Poisson's ratio,
7. Modulus of rigidity,
8. Bulk Modulus,
9. working stress,
10. Factor of safety,
11. Resilience,
12. Strain Energy,
13. Proof resilience and
14. Modulus of Resilience

5.2 Distinguish between different kinds of stresses and strains.

5.3 Draw the stress-strain curve for ductile materials (Mild steel) and hence explain the salient points in the curve.

5.4 State Hooke's law and limits of proportionality.

5.5 Solve problems on relationship between simple stress and simple strain under axial loading on uniform bars and stepped bars.

5.6 State the relationship among the elastic constants.

5.7 Solve problems on relationship between elastic constants.

5.8 Calculate stresses in simple and composite members under axial loading

5.9 Explain temperature stress, strain, hoops stress, temperature stresses in composite sections.

5.10 Calculate instantaneous stress and strain Energy due to dynamic loads and impact loading.

5.11 Explain the mechanical properties of materials like…..

COURSE CONTENT

1. Introduction

Mechanics-Engineering Mechanics-Applications and branches of Engineering Mechanics- Statics, Dynamics, Kinetics and Kinematics- Systems of measurements and Units- S.I and M.K.S units of physical quantities used in Civil Engineering

2. Forces & Moments

a) Definition of force; vectors and scalars; vector representation of a force; systems of forces; co-planar forces.

b) Resultant of forces at a point – Parallelogram Law and Triangle Law of forces – Lami's theorem – Polygon law of forces – Resolution of forces.

c) Parallel forces – like and unlike – moment of force-its units and sense-couple-moment of a couple – properties of a couple.

d) Conditions of equilibrium of a rigid body subjected to a number of co-planar forces.

e) Structural members supporting co planar forces- Types of supports- Types of beams- Types of loading- Determination of support reactions for simply supported beams with point loads and Uniformly distributed loading

3. Centroid

a) Definitions – Centroid, Centre of gravity
b) Position of Centroid of standard figures like rectangle, triangle, parallelogram circle, semi-circle and trapezium.
c) Determination of location of Centroid of standard sections- T, L, I, Channel section, Z section and built up sections consisting of RSJs and flange plates and plane figures having hollow portion.

4. Moment of Inertia

a) Definition of Moment of Inertia
b) Perpendicular and parallel axes theorems
c) Moment of Inertia of standard sections like rectangle, triangle, circle and hallow circular sections
d) Moment of Inertia of built up sections- T, L, I, Channel section, and Z sections using parallel axis theorem
e) Moment of Inertia and radius of gyration of built-up sections consisting of the combinations of RSJ's flange plates, channels & flange plates etc.
f) Polar Moment of Inertia of solid and hallow circular sections using Perpendicular axis theorem

5. Simple Stresses and Strains

a) Stress and strain – type of stresses and strains
b) Stress strain curves for ductile materials- mild steel, elastic limit, limit of proportionality, yield point, ultimate stress; breaking stress; working stress factor of safety.
c) Hooke's law – Young's modulus – deformation under axial load.
d) Shear stress and Shear Strain – Modulus of rigidity.
e) Longitudinal and lateral strain-poisson's ratio Bulk Modulus – relationship between elastic constants (proof not required, only problems).
f) Composite sections – effect of axial loads
g) Temperature stresses – strains – hoop stress - Temperature stresses in composite sections
h) Resilience – strain energy-proof resilience – and modulus of resilience – maximum instantaneous stress due to gradual, sudden, and shock loading.
i) Mechanical properties of materials-elasticity, plasticity, ductility, brittleness, malleability, stiffness, hardness, toughness, creep, fatigue, examples of materials which exhibit the above properties.

REFERENCE BOOKS

1. N. H.Dubey, Engineering Mechanics – (Tata Mc Graw Hill)
2. R.S.Kurmi, Engineering Mechanics
3. P.K. Abdul Latheef, Engineering Mechanics
4. Dayaratnam, Engineering Mechanics Statics
5. N. Srinivasulu, Engineering Mechanics

SURVEYING – I

Subject Title : Surveying – I
Subject Code : CE-106
Periods/Week : 03
Periods/Year : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay type
1.	Introduction to surveying	12	16	02	01
2.	Chain Surveying	36	42	04	03
3.	Compass Surveying	32	39	03	03
4.	Minor Instruments	10	13	01	01
	Total	90	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Know the basic facts about Surveying

1.1 State the concept of surveying.
1.2 State the purpose of surveying.
1.3 Distinguish between 1. Plane and 2. Geodetic surveying.
1.4 List the units of linear and angular measurements in Surveying and conversions.
1.5 List the instruments used for taking linear and angular measurements.
1.6 Classify different surveys.
1.7 State the fundamental principles of surveying.
1.8 State and explain the stages of survey operations.

2.0 Understand the principles of Chain Surveying

2.1 State the purpose of Chain surveying.
2.2 State the principle of Chain surveying.
2.3 Explain the principles used in Chain triangulation.
2.4 List different instruments used in Chain Surveying.
2.5 Explain the functions of different instruments used in Chain Surveying.
2.6 List the points to be followed while selecting the survey stations
2.7 Define ranging
2.8 Explain the methods of ranging a line.
2.9 List the operations involved in chaining on 1. Flat ground, 2.Sloping ground and 3. When high ground intervenes.
2.10 Describe in detail the method of setting out right angles
1. With or without cross staff and
2. Optical square.
2.11 Explain the

1. Field work procedure in Chain survey and
2. Method of recording field observations.

2.12 Know the errors and mistakes in Chain surveying.
2.13 Determine the corrections for measurement due to incorrect length of chain.
2.14 Explain the methods of overcoming different obstacles in chain surveying.
2.15 Explain the method of preparing site plans by Chain Surveying.
2.16 Calculate the areas of irregular boundaries using
1. Average Ordinate rule,
2. Trapezoidal rule and
3. Simpson's rule.

3.0 Principles of Compass Surveying

3.1 State the purpose of Compass surveying.
3.2 State the principles of Compass surveying.
3.2 Identify the parts of Prismatic Compass
3.3 Explain the functions of parts of Prismatic Compass
3.4 Define terms-
1. Whole Circle Bearing,
2. Quadrantal Bearing,
3. True meridian,
4. Magnetic meridian,
5. True bearing,
6. Magnetic bearing,
7. Dip,
8. Declination, and
9. Local attraction.

3.5 Convert Whole Circle Bearing in to Quadrantal Bearing and vice versa.
3.6 Explain the effect of local attraction
3.7 Compute corrected bearings for local attraction.
3.8 Compute the included angles of lines in a Compass traverse.
3.9 Compute the true bearings of lines in a Compass traverse.
3.10 Explain the operations involved in field in compass Surveying
3.11 Explain methods of recording field notes.
3.12 Explain the method of plotting Compass Surveying.
3.13 Explain the method of plotting closed traverse adjusting closing error by Bowditch rule.
3.14 List the errors in Compass surveying.

4.0 Uses and working principles of Minor Instruments

4.1 Explain the need for using Minor instruments
4.2 List various minor instruments used in surveying
4.3 Explain the uses of the following minor instruments:
1. Abney Level,
2. Pentagraph and
3. Electronic Planimeter

4.4 Explain the working principles of
1. Abney Level,
2. Pentagraph and 3. Electronic Planimeter

COURSE CONTENT

1.0 Classification and Principles of Surveying

Concept of Surveying-purpose of Surveying-Divisions of surveying- Classification of Surveying based on different criteria– Fundamental principles in Surveying - Measurements- Units and conversions-Instruments used for taking linear and angular measurements- Stages of survey operations-Field work, Office work, Care and adjustments of the instruments.

2.0 Chain Surveying

a) Purpose and Principle of Chain Survey ing -Suitability of Chain Surveying- Survey stations and their selection-Survey lines and offsets – Instruments used in Chain survey and their function

b) Ranging a survey line- direct ranging and Indirect ranging – Line ranger- Chaining a line –Duties of leader and follower- Chaining on a sloping ground- Errors and mistakes in ordinary chaining -Correction due to incorrect length of Chain- problems

c) Different operations in Chain Surveying- Setting out right angles with cross staff and Optical square- Cross staff survey Field work procedure- Recording field notes – field book-Conventional signs.

d) Obstacles in chaining-methods to overcome obstacles-Problems

e) Calculations of area – different methods –Average ordinate, Trapezoidal and Simpson's rules.

3.0 Compass Surveying

a) Introduction, Purpose, principle and uses of compass Survey-Traverse-Open and Closed Traverse –Theory of magnetism-Description working and use of Prismatic compass-Operations in using Compass before taking readings

b) Concept of Meridian-Types of meridians-Bearing and angle- Designation of bearings- Whole Circle Bearing. Quadrantal Bearing Conversions-

c) Field work in Compass Survey –field notes-traverse using prismatic compass.

d) Local attraction-detection and correction, Dip and Magnetic declination- Variation of Magnetic declination -calculation of true bearings-Determination of included angles from the given bearings and vice versa in compass traverse.

e) Plotting of Compass traverse-closing error and adjustments by Bowditch graphical method.

f) Precautions in using a Compass-Errors in Compass Surveying.

4.0 Minor instruments

Purpose of Minor instruments- Various minor instruments- Uses and working principles of Abney Level, Pentagraph and Electronic Planimeter

REFERENCE BOOKS

1. N.N.Basak, Surveying - Tata Mc Graw Hill
2. S.K.Duggal, Surveying Vol-I - Mc Graw Hill Edn (India) Pvt Ltd
3. Kulkarni and Kanetkar, Surveying and levelling Vol –1
4. B.C. Punmia, Surveying and Levelling Vol. – 1
5. R.Agor, Surveying and Levelling - Vol –1 Khanna Publishers

ENGINEERING DRAWING

Subject Title : Engineering Drawing
Subject Code : CE– 107
Periods/Week : 06
Periods per Year : 180

TIME SCHEDULE

S. No	Major Topics	Periods	Weight age of marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	03	-	-	-
2	Drawing instruments				
3	Free hand lettering & Numbering	06	5	1	-
4	Dimensioning Practice	12	5	1	-
5	Geometrical construction	24	10		1
6	Projection of points, Lines, Planes and solids	30	10		1
7	Orthographic Projection	30	15	1	1
8	Sectional views	18	10		1
9	Auxiliary views	06	5	1	
10	Pictorial drawing	30	10		1
11	Development of surfaces	21	10		1
Total		**180**	**80**	**04**	**06**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the Importance of Engineering Drawing

1.1 State the importance of drawing as an engineering communication medium.
1.2 State the need for I.S. Code of practice for Engineering Drawing.
1.3 Explain the linkages between Engineering drawing and other subjects of study in Diploma course.

2.0 Understand the use of Engineering Drawing Instruments

2.1 Select the correct instruments for drawing lines of different orientation.
2.2 Select the correct instruments for drawing small and large circles.
2.3 Select the correct instruments for measuring distances on the drawing.
2.4 Use correct grade of pencil for different types of lines, thicknesses given function.
2.5 Select and use appropriate scales for a given applications.
2.6 Identify different drawing sheet sizes as per I.S. and Standard Lay-outs.
2.7 Prepare Title block as per I.S. Specifications.
2.8 Identify the steps to be taken to keep the drawing clean and tidy.

3.0 Write Free Hand Lettering and Numbers

3.1 Write titles using sloping lettering and numerals as per B.I.S (Bureau of Indian standards)
3.2 Write titles using vertical lettering and numerals as per B.I.S.
3.3 Select suitable sizes of lettering for different layouts and applications.
3.4 Make the use of lettering stencils.

4.0 Understand Dimensioning Practice

4.1 State the need for dimensioning the drawing according to accepted standard.
4.2 Define “Dimensioning”.
4.3 Identify notations of Dimensioning used in dimensioned drawing.
4.4 Identify the system of placement of dimensions in the given dimensioned drawing.
4.5 Dimension a given drawing using standard notations and desired system of dimensioning.
4.6 Dimension standard features applying necessary rules.
4.7 Arrange dimensions in a desired method in a given drawing.
4.8 Identify the departures, if any, made in the given dimensioned drawing with reference to SP-46 - 1988, and dimension the same correctly.

5.0 Apply Principles of Geometric Constructions

5.1 Divide a given line into desired number of equal parts internally.
5.2 Draw tangent lines and tangent arcs.
5.3 Construct a Hexagon from the given data.
5.4 Define ellipse, parabola, hyperbola, involute, cycloid and helix.
5.5 Construct ellipse by concentric circles method and using a paper trammel.
5.6 Construct parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
5.7 State the applications of the above constructions in engineering practice.

6.0 Apply Principles of Projection of points, lines & planes

6.1 Explain the projection of a point with respect to reference planes (HP & VP)
6.2 Explain the projections of straight lines with respect to two reference planes.
6.3 Explain the projections of perpendicular planes.

7.0 Apply principles of Orthographic Projection

7.1 Explain the principles of Orthographic projection with simple sketches.
7.2 Prepare orthographic views of a given simple Engineering part in first angle projection.
7.3 Draw the orthographic views of an object, given its pictorial drawing.
7.4 Sketch the minimum number of views needed to represent a given object fully.
7.5 Identify the object, from a number of orthographic views given.
7.6 Supply the missing view when two other views of an object are given.

8.0 Appreciate the need of Sectional Views

8.1 Explain the need to draw sectional views.
8.2 Select the section plane for a given component to reveal maximum information.
8.3 Draw sectional view for the component in 8.2.

8.4 Apply conventional practices and identify the parts, which should not be shown in section while drawing sectional views.
8.5 Make conventional representation of Engineering materials as per latest B.I.S. Code.
8.6 Apply principles of hatching.
8.7 Draw simple sections (full, half, revolved and removed part) for a range of simple Engineering objects.
8.8 Draw the component from a given set of sectional views.

9.0 Understand the need for Auxiliary Views

9.1 State the need of Auxiliary views for a given Engineering Drawing.
9.2 Sketch the auxiliary views of a given Engineering component to indicate the true shape and size of component.
9.3 Draw the auxiliary views of a given object or set of orthographic views.

10.0 Prepare Pictorial Drawings

10.1 State the need for commonly used type of pictorial drawings.
10.2 Given the objects, draw their orthographic views.
10.3 State the need of isometric scale and isometric projection.
10.4 Prepare Isometric projections and isometric views for the given orthographic drawings.
10.5 Prepare oblique drawing (cavalier, cabinet) of simple Engineering objects from the given data.
10.6 Identify the correct pictorial views from a set of Orthographic drawings.

11.0 Prepare Development Drawings

11.1 State the need for preparing development drawing.
11.2 Prepare development of simple Engineering objects using parallel line and radial line method.
11.3 Prepare development of surfaces of Engineering components like trays, funnels, 90^0 elbows & rectangular ducts.

COURSE CONTENT

NOTE

1. **I.S. / B.S Latest Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 Understand the importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing and its importance as a graphic communication
Need for preparing drawing as per standards – SP-46 –1988
Mention of I.S.O and B.I.S – Role of drawing in – Engineering education
Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description – Scales:

Recommended scales – reduced & enlarged – Lines: Types of lines, selection of line thickness – Selection of Pencils – Sheet Sizes: A0, A1, A2, A3, A4, A5 – Layout of drawing sheets in respect of A0, A1, A3 sizes – Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet – To draw "Lay out of sheet "as per SP-46-1988 to a suitable scale.

Simple Exercises on the use of Drawing Instruments.

Importance of Title Block.

Drawing Plate 1: (Consisting of about two exercises)

To draw geometric shapes (standard) using drawing instruments

To draw layout of sheet and title block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering – Guide Lines for Lettering – Recommended sizes of letters & numbers – Advantages of single stroke or simple style of lettering – Use of lettering stencils

Drawing plate 2: (Consisting of about 5 to 6 exercises)

To print the table of Types of lines as per latest ISI Standards.

To print the table of "Recommended sizes of letters and numerals" – as per Standards.

Selection of suitable size of letters and numbers and draw the given titles, phrases using both vertical and sloping styles.

4.0 Dimensioning practice

Purpose of engineering Drawing – need of I.S.I code in dimensioning –Shape description of an Engineering object -Definition of Dimensioning size description – Location of features, surface finish, fully dimensioned Drawing – Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools – Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions – Chain, parallel, combined, progressive, and dimensioning by co-ordinate methods – The rules for dimensioning standard, features "Circles (holes), arcs, angles, tapers, chamfers, and dimensioning of narrow spaces.

Drawing Plate 3: (Consisting of above 12 to 15 exercises)

Dimensioning a given drawing using the above tools, rules and systems of dimensioning.

Dimensioning practice in various methods of dimensioning stated above.

Dimensioning, given common features listed.

Exercise in identifying the departures made in a given dimensioned drawing from I.S.I. Code of practice.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally – examples in Engineering application.

Construction of tangent lines: to draw tangent lines touching circles internally and externally.

Construction of tangent arcs

i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).

ii) Tangent arc of given radius touching a circle or an arc internally or externally and a given line.
iii) Tangent arcs of radius R, touching two given circles internally and externally.
Hexagon: Inscribing a Hexagon in a circle of given diameter and circumscribing about a given circle, using
i) Set squares.
ii) Compass – given a side to construct a Hexagon using set squares or compass.
Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engineering application viz. Bolts and Nuts, Projectiles, reflectors P.V. Diagram of a Hyperbolic process – Construction of Ellipse using
i) Concentric circles method.
ii) Paper trammel method.
iii) Construction of parabola by rectangular method.
iv) Construction of Rectangular Hyperbola when the position of a point on the curve is given.
General Curves: Involute, Cycloid and Helix – explanations as locus of a moving point, their Engineering application, viz, Gear tooth profile, screw threads, springs etc. and their construction:
Drawing Plate: 4 (Consisting of about 12 to 15 exercises)
Exercises mentioned above at the rate of at least one problem on each "construction".

6.0 Projection of points, lines and planes.

Projecting a point on two planes of projection – Projecting a point on three planes of projection
Projection of straight line.
(a) Parallel to one or both the planes.
(b) Contained by one or both the planes.
(c) Perpendicular to one of the planes.
(d) inclined to one plane only and parallel to other plane.
Projection of perpendicular planes
(a) Plane perpendicular to both HP and VP
(b) Plane perpendicular to HP and parallel to VP and Vice versa.
(c) Plane perpendicular to HP and inclined to VP and vice versa.
Projection of Regular solids in simple positions

7.0 Orthographic Projections

Meaning of Orthographic Projection – Using a viewing Box and a model – Number of views obtained on the six faces of the box – Neat sketches of only 3 views for describing object – Concept of front view, top view, and side views – sketching these views for a number of Engineering objects – Explanation of "First angle projection". – Positioning of three views in First angle projection – Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given – Method of representing hidden lines – Selection of minimum number of views to describe an object fully.
Drawing Plate 5: (Consisting of about 10 to 12 Number of exercises)
Given an engineering object(s) to sketch the three views.
Given the pictorial view of simple objects to sketch the three views in
First and third angle projections.
Given the object (pictorial Drawing) and 3 views identifying the surface
on the views with reference to the object.

Given two views of a simple object – Draw the missing third view.

Drawing Plate 6: (Consisting of about 6 to 8 exercises)

Given the engineering objects (Pictorial views) Drawing the three views n First angle projection.

Identifying the object, when a number of objects and the orthographic views are given (matching exercises).

8.0 Sectional views

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) – Meaning of Full, half, revolved and removed, local or partial sections – Hatching – adjacent components (two or more) large areas, a part in different parallel planes – Conventional practices to represent sections of ribs, shafts, bolts, nuts, screws, rivets, spokes, webs, keys, cotters, thin sections etc., as per B.I.S. specifications – Conventional representation of materials as per B.I.S. Standards.

Drawing Plate 7: (Consists of about 8 to 10 exercises)

Preparing conventional representation of materials as per latest / B.I.S. Code.

Given the object (pictorial or orthographic view), and cutting plane line to draw sectional view.

Given the object to select the correct cutting plane line and then to draw the sectional view.

To identify the object when number of objects and number of sectional views are given (Matching exercise.)

9.0 Auxiliary views

Need for drawing auxiliary views – Explanation of the basic principles of drawing an auxiliary view – explanation of reference plane and auxiliary plane – Partial auxiliary view.

Drawing plate No.8: (Consisting of about 8 exercises)

Given a set of objects or orthographic views state whether an auxiliary view is needed – if required sketch the same.

Given the object and its auxiliary view (partial or full, to sketch the auxiliary plane on the pictorial view)

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective – Use of the pictorial drawings – Isometric drawings: Isometric axes, angle between them, meaning of visual distortion in dimensions – Need for an isometric scale, difference between Isometric scale and ordinary scale, difference between Isometric drawing (isometric view and Isometric Projection) and orthographic drawing – Isometric and non-Isometric lines – Isometric drawing of common features like rectangular, square and circular shapes – non-isometric lines – Use of box and offset construction – Oblique drawings: Their use – Cavalier and cabinet drawings – Oblique drawing of common features like rectangular, circular and inclined, surfaces – Selection of the face of the object to be included in the front view.

Draw plate 9: (Consists of about 10 to 12 exercises)

Given the Orthographic views to draw isometric views

Construction of isometric scale

Given the Orthographic views to draw isometric projections
Given the Orthographic views to draw cavalier Drawings
Given the Orthographic views to draw cabinet Drawings

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal Work – Concept of true length of a line with reference to its Orthographic projection when the line is (i) parallel to the plane of projection (ii) When it is inclined to one principal and parallel to the other – Development of simple Engineering common solids like Cubes, prisms, Cylinders, Cones, Pyramid (sketches only) – Types of Development: Parallel line and radial line development – Procedure of drawing development of surfaces of trays, funnels, 90^0 elbow pipes and rectangular ducts.

Drawing plate No. 10: (Consists of about 10 exercises)

Development drawings by "Parallel – line" method such as prisms and Cylinders (Truncated)

Development drawing by "Radial – line "method such as cones and pyramids (Truncated)

Development drawings of a tray, funnel, 90^0 elbow and rectangular duct

REFERENCE BOOKS

1. N.D.Bhatt, Engineering Drawing
2. A.C. Parkinson (Metric Edition), A First Year Engineering Drawing
3. T.T.T.I., Madras, T.S.M. & S.S.M on Technical Drawing
4. Bureau of Indian Standards, SP-46-1998
5. R.C.Mouli, V.Rama Rao and M. Venkateswarlu, Introduction to Engineering Drawing
6. Gary Robert Bertoline, Introduction to graphics for Engineering (Fourth edition), Tata McGraw Hill
7. Gary Robert Bertoline, Fundamentals of Graphics Communication (Sixth edition)
8. Albert Boundy, Engineering Drawing 7^{th} Edition
9. P I Varghese, Engineering Graphics, Tata McGraw Hill

SURVEY-I PRACTICE & PLOTTING

Subject Title : Survey – I practice & plotting
Subject Code : CE-108
Periods/Week : 06 (4+2)
Periods/Year : 180

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Chain surveying	60
2.	Compass Surveying	60
3.	Minor instruments	12
4.	Plotting	48
	Total	180

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Apply standard Practices to perform chain survey in the field and to plot from field data

1.1 Practice unfolding and folding a chain.
1.2 Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the field book..
1.3 Perform direct ranging on level ground and measure the distance between two given stations using line ranger.
1.4 Perform indirect ranging and measure the distance between two given stations when a high ground intervenes to prevent intervisibility of ends of line.
1.5 Set out a right angle to a given chain line by using chain only.
1.6 Set and measure offsets for a given chain line by
1. Perpendicular offsets and 2.Oblique offsets.
1.7 Perform triangulation survey of a given area with chain and cross staff and record all necessary nearby details.
1.8 Calculate the area bounded by the given points by chain triangulation and compare the result with the area calculated from plotting.
1.9 Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements.
1.10 Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements.

2.0 Apply Principles to Perform compass survey and plot from field data

2.1 Identify the parts of a prismatic Compass
2.2 Set up the compass at a station and carry out temporary adjustments.
2.3 Take bearings of two points from instrument station and calculate the included angle.
2.4 Perform an open compass survey with Compass and Chain.
2.5 Perform a closed traverse with compass and chain.

2.7 Plot the closed traverse from field data and adjust for closing error by Bowditch rule.
2.8 Determine the area bounded by the given points by the method of Radiation.
2.9 Determine the distance between two accessible points involving single setting of the instrument.
2.10 Determine the distance between two inaccessible points involving setting of the instrument at two stations.

3.0 Learn from demonstration of various minor instruments
3.1 Demonstrate Abney level for taking angle of elevation and depression
3.2 Demonstrate Pentagraph to reduce and enlarge a given map and drawing.
3.3 Demonstrate Electronic Planimeter for measuring areas of irregular shape.

4.0 Apply principles of mapping from the field work and plot the from the field work measurements.
4.1 Understand the importance and relation between field work and plotting.

Key competencies to be achieved by the student

S.No	Experiment title	Competencies	Key competencies
1	a) Practice unfolding and folding of a chain b) Ranging a survey line by direct ranging and determine the distance between two points	a) Hold both the handles in the left hand and throwing the chain swiftly with the right hand in the forward direction. b) Fixing the ranging rod vertically in the ground c) Range by eye	---
2	a) Range a survey line by a line ranger b) Range a survey line by indirect ranging and determining the distance between two points	a) Move the instrument backward and forward at right angles to the line until two images appear one above the other exactly in the same vertical line. b) Observe the images of the ranging rods A and B in upper and lower prisms at the same time. c) Ensure the ranging rods at end stations are visible from the selected intermediate positions	Move the instrument backward and forward at right angles to the line until two images appear one above the other exactly in the same vertical line.
3	Set and measure perpendicular and oblique offsets	a) Measure the chainage accurately b) Hold the cross staff vertically and viewing both	Hold the cross staff vertically and viewing both the slits to coincide with chain line

		the slits to coincide with chain line and object line c) Measure the length of Oblique offsets accurately.	and object line
4	Calculate area of a given boundary by Cross staff survey	a) Run the chain line through the centre of the field. b) Take perpendicular and oblique offsets	Take perpendicular and oblique offsets
5	Perform triangulation survey of a given area with chain and cross staff.	a) Measure the length of base line accurately b) Measure the offsets correctly c) Record the field work observations correctly	a)Select the stations for full visibility b) Measure the length of base line accurately c) Accurately set the offsets
6	Perform chain traverse survey of a given area with chain and cross staff	a) Select main survey stations with clear intervisibility b) Measure the length of base line accurately c) Measure the offsets correctly d) Record the field work observations correctly	e) Select main survey stations with clear intervisibility b) Accurately set the offsets
7	Set up the compass at a station and carry out temporary adjustments	a)Fix the compass with tripod stand over the station b) Center the compass c) Level the compass	Centering the compass over the ground station
8	Taking bearings of the given traverse	a) Observe and record the bearings correctly b) Detect the local attraction, if any	Taking the bearings accurately
9	Perform an open traverse survey with Compass and Chain	a) Bisecting the object accurately with the cross hair b) Measure the fore and back bearings of the traverse legs by Prismatic compass after fixing the local magnetic meridian	Bisecting the object accurately with the cross hair
10	Perform a closed traverse survey with Compass and Chain and adjust for closing error by Bowditch method.	a) Bisecting the object accurately with the cross hair b) Measure the fore and back bearings of the traverse legs by Prismatic compass after fixing the local magnetic meridian	Bisecting the object accurately with the cross hair
PLOTTING			
11	Determine the area bounded by the given points by the	Calculate included angles from a given bearings and	Calculate included angles from a given

	method of Radiation	check for sum of included angles	bearings and check for sum of included angles
12	Determine the distance between two accessible points involving single setting of the instrument	Locate a point from which both the accessible points are visible.	Locate a point from which both the accessible points are visible.
13	Determine the distance between two inaccessible points involving setting of the instrument at two stations	Select at least two accessible and intervisible stations and measure the distance and take the bearings	Select at least two accessible and intervisible stations and measure the distance and take the bearings
DEMONSTRATION			
14	Demonstrate Abney level for taking angle of elevation and depression	a) Measure the vertical angle by directing the instrument towards the object and exactly bisecting with cross wires b) Measure the slope of the ground	----
15	Demonstrate Pentagraph to reduce and enlarge a given map and drawing.	Keep two arms equal and for every position, the two arms should remain as parallelogram	----
16	Demonstrate Electronic Planimeter for measuring areas of irregular shape.	Move the tracing point gently and exactly along the boundary line	----

COURSE CONTENT

Chain Surveying

a) Practice unfolding and folding of a chain.
b) Ranging and chaining of lines on level ground and recording in field book to measure the distance between two stations.
c) Ranging a survey line using a line ranger
d) Chaining a line involving indirect ranging.
e) Setting and measuring the offsets-Perpendicular and Oblique offsets
f) Measurement of land areas –cross staff survey
g) Chain triangulation around the building covering a small area with other details taking offsets and recording.
h) Chain triangulation involving a road with other details taking offsets and recording.
i) Chain traversing to survey an area bounded by more than three stations.

Compass Surveying

a) Setting up the compass – observations of bearings
b) Calculation of included angles from the observed bearings
c) Traversing with prismatic compass and chain – open Traverse – Recording.
d) Traversing with prismatic compass and chain- closed traverse - recording.
e) Plotting the closed traverse from field data and adjust for closing error by Bowditch rule.
f) Determination of the area bounded by the given points by the method of Radiation

g) Determination of the distance between two accessible points involving single setting of the instrument

h) Determination of the distance between two inaccessible points involving setting of the instrument at two stations.

Minor Instruments

a) Demonstration of Abney level for taking angle of elevation and depression

b) Demonstration of Pentagraph to reduce and enlarge a given map and drawing.

c) Demonstration of Electronic Planimeter for measuring areas of irregular shape.

Plotting

a)	Conventional signs in Surveying	2 Exercises
b)	Plotting of perpendicular and oblique offsets	1 Exercise
c)	Plotting of land surveys – Chain and cross-staff Surveying – Calculation of areas	4 Exercises
d)	Plotting of chain triangulation Surveying of small areas around Buildings.	4 Exercises
e)	Chain traversing to survey an area bounded by more than three stations	2 Exercises
f)	Plotting of closed traverse by Compass surveying – location of Details and adjusting error by Bow ditch method.	2 Exercises 3 Exercises
f)	Plotting of open traverse by Compass surveying and locating details	2 Exercises.
g)	Compass survey by method of radiation-calculation of area	1 Exercise
h)	Determination of the distance between two accessible points involving single setting of the instrument	1 Exercise
I)	Determination of the distance between two inaccessible points involving setting of the instrument at two stations.	2 Exercises
	Total	24 Exercises

ENGINEERING PHYSICS LAB PRACTICE

Subject Title : Engineering Physics Lab Practice
Subject Code : Common -109 A
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	TOTAL	**45**

OBJECTIVES
Upon completion of the course the student shall be able to

1.0 Practice the Vernier caliper to determine the volume of a cylinder and sphere
2.0 Practice the Screw gauge to determine thickness of a glass plate and cross section of a wire
3.0 Verify the parallelogram law and Triangle law
4.0 Determine the value of acceleration due to gravity using Simple Pendulum
5.0 Determine the velocity of sound in air at room temperature
6.0 Determine the Focal length and focal power of convex lenses using U-V method
7.0 Determine the refractive index of a solid using travelling microscope
8.0 Determine the surface tension of a liquid using travelling microscope
9.0 Determine the viscosity of a liquid using capillary method
10.0 Verify the Boyle's law employing a Quill tube
11.0 Determine the specific resistance of wire material using Meter Bridge
12.0 Practice the mapping of magnetic lines of force

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
1. Hands on practice on Vernier Calipers	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the volume of given object	• Read the scales • Calculate the volume of given object
2. Hands on practice on Screw gauge	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire
3. Verification of Parallelogram law of forces and Triangle law of forces	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph
5. Velocity of sound in air –Resonance method	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound • Calculate velocity of sound at 0^0 C

Name of the Experiment	Competencies	Key competencies
6. Focal length and Focal power of convex lens (Separate & Combination)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v curves	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graph
7. Refractive index of solid using traveling microscope	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water
9. Coefficient of viscosity by capillary method	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water

Name of the Experiment	Competencies	Key competencies
10. Boyle's law verification	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
11. Meter bridge	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

ENGINEERING CHEMISTRY LAB PRACTICE

Subject Title : Engineering Chemistry Lab Practice
Subject Code : Common -109 B
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making different diluted solution.	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. $KMnO_4$	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA solution	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength to	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	**45**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipetts, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.
2.0 Practice making standard solutions with pre weighted salts and to make desired dilutions using appropriate techniques.
3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl
4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH
5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4
6.0 Conduct titrations adopting standard procedures and using Std. $KMnO_4$ solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions
   a) To determine conductivity
   b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment	**Competencies**	**Key competencies**
Familiarization of methods for Volumetric analysis	--	--
Preparation of Std Na_2CO_3 and making different diluted solution	▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions
Estimation of HCl solution using Std. Na_2CO_3 solution	▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
Estimation of NaOH using Std. HCl solution		
Estimation of H_2SO_4 using Std. NaOH solution		

Estimation of Mohr's Salt using Std. $KMnO_4$		
Determination of acidity of water sample		
Determination of alkalinity of water sample		
Determination of total hardness of water using Std. EDTA solution		
Estimation of Chlorides present in water sample		
Estimation of Dissolved Oxygen (D.O) in water sample (By titration method)		
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Determination of pH using pH meter		
Determination of conductivity of water and adjusting ionic strength to required level		
Determination of turbidity of water		
Estimation of total solids present in water sample	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDEMENTALS LAB PRACTICE
(Common to all branches)

Subject Title : Computer Fundamentals Laboratory Practice
Subject Code : CE-110
Periods/Week : 03
Periods/Year : 90

List of Experiments

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	01	03
II.	Windows Operating System	02	06
III.	MS Word	09	27
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
	Total	30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to widespread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a).To Familiarize with Computer system and hardware connections

   b).To start and Shut down Computer correctly
   c). To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system (Not for end examination)

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells

16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board	a. Login and logout as per the standard procedure b. Operate mouse &Key Board
1 (c).	To Explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	a. Find the details of Operating System being used b. Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders	a. Create files and folders Rename , arrange and search for the required folder/file

Exp No.	Name of the Experiment	Competencies	Key Competencies
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers

Exp No	Name of the Experiment	Competencies	Key Competencies
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table –marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar-Title Bar- Ribbon-Worksheets- Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit

Exp No	Name of the Experiment	Competencies	Key Competencies
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
21.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in Home, insert , design, animation , slideshow, Review &View in the PowerPoint	Access required options in the tool bar

Exp No.	Name of the Experiment	Competencies	Key Competencies
22.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation	a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects	Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
26.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
27.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.

Exp No.	Name of the Experiment	Competencies	Key Competencies
28.	To Insert audio &video, Hyper links in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like *Entrance, Emphasis, Motion Paths &Exit*	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
III Semester (SECOND YEAR)

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE-301	Mathematics - II	4	-	60	3			100
CE-302	Mechanics of Solids	4	-	60	3			100
CE-303	Hydraulics	5	-	75	3			100
CE-304	Surveying - II	3	-	45	3			100
CE-305	Construction Materials	4	-	60	3			100
CE-306	Construction Practice	4	-	60	3			100
PRACTICAL:								
CE-307	Civil Engineering Drawing - I	-	6	90	3			100
CE-308	Surveying - II Practice & Plotting	-	6 (4+2)	90	3			100
CE-309	Material Testing Practice	-	3	45	3			100
CE-310	Hydraulics Practice	-	3	45	3			100
TOTAL		24	18	630	-			900

ENGINEERING mATHEMATICS – II
(Common to all branches)

Subject Title : Engineering Mathematics - II
Subject Code : CE-302
Periods/Week : 03
Periods/Semester : 60

Blue Print

S. No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
	Unit - I			R	U	App	R	U	App
1	**Indefinite Integration**	18	34	2	1	0	1	1	1/2
	Unit - II								
2	**Definite Integration and its applications**	17	31	0	1	1	0	1	1 1/2
	Unit - III								
3	**Differential Equations of first order**	15	29	2	1	0	1/2	1/2	1
	Unit - IV								
4	**Statistical Methods**	10	16	1	1	0	1	0	0
	Total	60	110	5	4	1	2 1/2	2 1/2	3
			Marks:	15	12	3	25	25	30

R: Remembering type 40 marks
U: Understading type 37 marks
App: Application type 33 marks

OBJECTIVES
Upon completion of the course the student shall be able to

Unit-I

1.0 Use Indefinite Integration to solve engineering problems

1.1 Explain the concept of Indefinite integral as an anti-derivative.

1.2 State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\,dx$ and $\int ku\,dx$ where k is constant and u, v are functions of x.

1.3 Solve integration problems involving standard functions using the above rules.

1.4 Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\,dx$ where $f(x)\,dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\,dx$

iii) $\int f'(x)/[f(x)]\,dx$

iv) $\int f\{g(x)\} g'(x)\,dx$

1.5 Find the Integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ using the above.

1.6 Evaluate the integrals of the form $\int Sin^m\theta\ Cos^n\theta.\,d\theta$ where m and n are positive integers.

1.7 Evaluate integrals of powers of $\tan x$ and $\sec x$.

1.8 Evaluate the Standard Integrals of the functions of the type

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

1.9 Evaluate the integrals of the type

$$\int \frac{1}{a \pm bSin\theta} d\theta, \int \frac{1}{a \pm b\cos\theta} d\theta \text{ and } \int \frac{1}{a\cos\theta \pm b\sin\theta \pm c} d\theta .$$

1.10 Evaluate integrals using decomposition method.

1.11 Evaluate integrals using integration by parts with examples.

1.12 State the Bernoulli's rule for evaluating the integrals of the form $\int u.v\,dx$.

1.13 Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\,dx$.

Unit-II

2.0 Understand definite integral and use it in engineering applications

2.1 State the fundamental theorem of integral calculus

2.2 Explain the concept of definite integral.

2.3 Calculate the definite integral over an interval.

2.4 State various properties of definite integrals.

2.5 Evaluate simple problems on definite integrals using the above properties.

2.6 Explain definite integral as a limit of sum by considering an area.

2.7 Find the areas under plane curves and area enclosed between two curves using integration.

2.8 Obtain the volumes of solids of revolution.

2.9 Obtain the mean value and root mean square value of the functions in any given interval.

2.10 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and provide some examples.

Unit –III

3.0 Solve Differential Equations in engineering problems

3.1 Define a Differential equation, its order, degree

3.2 Form a differential equation by eliminating arbitrary constants.

3.3 Solve the first order first degree differential equations by the following methods:

i. Variables Separable.
ii. Homogeneous Equations.
iii. Exact Differential Equations
iv. Linear differential equation of the form $dy/dx + Py = Q$, where P and Q are functions of x or constants.
iv. Bernoulli's Equation (Reducible to linear form.)

3.4 Solve simple problems leading to engineering applications

Unit –IV

4.0 Use Statistical Methods as a tool in data analysis

4.1 Recall the measures of central tendency.

4.2 Explain the significance of measures of dispersion to determine the degree of heterogeneity of the data.

4.3 Find the measures of dispersion – range, quartile deviation, mean deviation, standard deviation for the given data.

4.4 Explain the merits and demerits of the above measures of dispersion.

4.5 Express relationship between measures of dispersion

4.6 Find the coefficient of variation

4.7 Explain bivariate data.

4.8 Explain the concept of correlation between two variables and co-varience.

4.9 Explain coefficient of correlation and its properties

4.10 Calculate the coefficient of correlation between two variables.

4.11 Find rank correlation co-efficient.

COURSE CONTENT

Unit-I

Indefinite Integration

1**.** Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of indefinite integral. Integration by substitution or change of variable. Integrals of the form $\sin^m\theta . \cos^n\theta$. where m and n are positive integers. Integrals of tan x, cot x, sec x, cosec x and powers of tan x, sec x by substitution.

Evaluation of integrals which are reducible to the following forms :

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

Integration by decomposition of the integrand into simple rational, algebric functions. Integration by parts , Bernoulli's rule.

Unit-II

Definite Integral and its applications

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Volumes of solids of revolution. Mean and RMS values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

Unit –III

Differential Equations

3. Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of first order, first degree: variable-separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Unit –IV

Statistical Methods

4. Revise measures of central tendency, measures of dispersion: range, quartile deviation, mean deviation, standard deviation for the given data, merits and demerits, relationship between measures of dispersion, coefficient of variation, bivariate data, concept of correlation, covariance, coefficient of correlation and its properties, rank correlation co-efficient.

REFERENCE BOOKS

1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. Statistical Methods Vol.I, Das, Tata McGraw-Hill
4. Statistics, 4/e, Schaum's Outline Series (SIE), McGraw-Hill

MECHANICS OF SOLIDS

Subject Title : Mechanics of Solids
Subject Code : CE-302
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Shear force and Bending Moment	15	29	03	02
2.	Theory of simple bending	17	29	03	02
3.	Deflection of beams	18	32	04	02
4.	Thin cylindrical shells	05	10	-	01
5.	Torsion	05	10	-	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Determine Shear Force and Bending Moment of simple beams analytically

1.1 Define
- a) Cantilever beam
- b) Simply supported beam
- c) Fixed beam
- d) Continuous beam
- e) Overhanging beam

1.2 Define
- a) Point Load
- b) Uniformly Distributed Load

1.3 Describe
- a) Roller support
- b) Hinged support
- c) Fixed support

1.4 Calculate reactions at rollers/hinged and fixed supports for
1. Simply Supported beams,
2. Cantilever beams and
3. Overhanging beams.

1.5 Explain
   a) Shear Force and
   b) Bending Moment
1.6 Explain sign conventions used for drawing
   1. Shear Force and
   2. Bending Moment
1.7 Deduce the relationship among the rate of loading, shear force and bending moment
1.8 Determine Shear Force and Bending Moments on
   1.Cantilever and
   2.Simply Supported beams
   for simple cases of loading (Point Load, Uniformly Distributed Load) analytically
1.9 Describe the procedures for sketching the Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD)
1.10 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for Cantilever and Simply Supported Beams
1.11 Define point of contra flexure
1.12 Determine the Shear Force, Bending Moment and point of contraflexure for overhanging beams
1.13 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for overhanging beams

2.0 Understand the Effect of Loading on Beams

2.1 Define simple / pure bending
2.2 Explain the process of simple bending
2.3 Define
   a) Neutral layer
   b) Neutral axis
   c) Radius of curvature
2.4 List the assumptions made in the theory of simple bending.
2.5 Derive the bending equation for simple bending
2.6 Prove that the neutral axis passes through centroid of cross section
2.7 Define
   a) Bending Stress
   b) Moment of Resistance
2.8 Sketch bending stress distribution across the depth of the beam for any cross section.
2.9 Explain bending stress distribution across the depth of the beam for any cross section.
2.10 Define
   a) Modulus of section
   b) Flexural rigidity
2.11 Derive the formula for section modulus of (solid and hollow sections)
   a) Square Section
   b) Rectangular Section
   c) Circular Section
2.12 Calculate section modulus based on above formulae
2.13 Solve problems on theory of simple bending for
   1. Symmetrical and
   2. Unsymmetrical sections
   to calculate

a) Moment of Resistance or
b) Load carried or
c) Dimensions of cross section.

2.14 State formula for calculation of Shear Stress in any layer of a cross section (Derivation of formulae not required)

2.15 Draw shear distribution across
a) Rectangular section
b) Solid circular section
c) I - section
d) T - section

2.16 Determine shear stress at any layer and draw shear stress distribution diagram across
a) Rectangular section
b) I - section

2.17 Determine the maximum shear stress in circular, rectangular and square sections (Derivation of formulae not required)

3.0 Understand Deflection of Beams under Loading

3.1 Draw the deflected shapes of different beams (like rectangular, square, circular beams)

3.2 Define
a) Elastic curve
b) Slope
c) Deflection

3.3 Distinguish between strength and stiffness of a beam.

3.4 Derive relation between slope, deflection and radius of curvature

3.5 Derive the equations for maximum slope and deflection by double integration method for:
a) Cantilever beams with point loads and uniformly distributed loads
b) Simply supported beams with central point load or uniformly distributed load throughout.

3.6 Calculate the maximum slope and deflection in simply supported and cantilever beams using the above formulae

3.7 Explain Mecaulay's method (for Simply supported beams) to find the slope and deflections

3.8 Compute the maximum slope and deflection for Simply Supported beam carrying point loads and uniformly distributed loads by Mecaulay's method

3.9 Explain the moment area method for slope and deflection

3.10 Define
a) Mohr's theorem-I
b) Mohr's theorem-II

3.11 Derive formulae for maximum slope and deflection of standard cases by moment area method

3.12 Compute the maximum slope and deflections for
1. Cantilever and
2. Simply Supported Beams
by Mohr's theorem-I and Mohr's theorem-II (moment area method)

4.0 Understand the effects of Internal pressure on welded and riveted thin cylinders

4.1 Define thin Cylinder

4.2 Explain failures of thin Cylinders

4.3 Explain 1.Longitudinal and 2. Hoop stresses in the cylinder under internal pressure

4.4 State the formulae for longitudinal and hoop stresses in
1. Riveted and
2.Welded thin cylinders

4.5 Calculate the longitudinal and hoop stresses in the cylinder under internal pressure, given the dimensions of the
1. Riveted and 2. Welded thin cylinders

4.6 Calculate the thickness of a thin cylinder (riveted / welded)

4.7 State the formulae for strains and changes in dimensions of a thin cylinder

4.8 Calculate the changes in dimensions of a thin cylinder under internal pressure

5.0 Understand the effects of pure Torsion on Solid and Hollow Circular Shafts

5.1 Define pure Torsion

5.2 List the assumptions made in the pure Torsion

5.3 State the formula for pure Torsion of a circular shaft (Derivation not required)

5.4 Solve the problems on Torsion applying Torsion formula

5.5 Explain
a) Polar modulus
b) Torsional rigidity

5.6 State the formula for power transmitted by the circular shaft

5.7 Solve the problems on power transmitted by
1. solid and 2.Hollow circular shafts

COURSE CONTENT

1.0 Shear force and bending Moment

a) Beams – Types of beams – Cantilevers – Simply supported – Overhanging – Fixed and continuous.
b) Types of supports – Roller – Hinged – Fixed,
c) Explanation of S.F and B.M. at a section
d) Relation between rate of loading SF and BM
e) Calculation of S.F. and B.M values at different sections for cantilevers Simply supported beams, overhanging beams under point loads and uniformly distributed loads, position and significance of points of contra flexure.
f) Drawing S.F. and B.M diagrams by analytical methods – location of points of contra flexure.

2.0 Stresses in Beams

a) Theory of simple bending – assumptions – Neutral axis – Bending stress distribution – Moment of resistance – curvature of beams – Bending equation – strength of beams – Rectangular, circular, and L sections practical applications – simple problems.

b) Shear stress in beams – Equation for shear stress in a layer of a beam (Derivation of formula not required) – Shear Stress distribution diagrams for various beam sections such as rectangular, solid circular and I sections – Problems.

3.0 Deflection of Beams

a) Deflected shapes of beams with different support conditions – Strength and stiffness of beams – Relation between curvature, slope and deflection
b) Double integration method – Derivation of standard cases – Problems
c) Macaulay's method for slope and deflection – Simply supported beam under concentrated and uniformly distributed loads – Problems.
d) Mohr's theorems for slope and deflection – Cantilevers and simply supported beams with symmetrical loading – Problems.

4.0 Thin Cylinders

a) Thin cylinders – Failure of thin cylinders.
b) Longitudinal and Hoop stresses in welded and riveted cylinders – Equations of stresses in thin cylinders (Derivation of formula not required) – Calculation of thickness in thin cylinders under internal pressures – Problems.
c) Strains and changes in dimensions (δd, δl, δv) of thin cylinders – Problems.

5.0 Torsion

a) Pure torsion – Assumptions – Torsion formula (Derivation not required) – Solid and hollow circular shafts subjected to pure torsion – Simple problems – Shear stress distribution in shafts.
b) Power transmitted by circular shafts – Problems

REFERENCE BOOKS

1. R.K. Rajput, Mechanics of Solids
2. S. Ramamurtham, Strength of Materials
3. Dr. B.C. Punmia, S.M and T.S
4. N. Srinivasulu, S.M and T.S
5. R.S. Khurmi Strength of Materials
6. D.S. Prakash Rao, Introduction to Strength of Materials
7. D.S. Prakash Rao, Strength of Materials (A practical approach) Vol–I
8. R.K. Bansal, Strength of Materials
9. Y. Ram Mohan Rao, S.M. and T.S.
10. B.K. Sarkar, Strength of Materials
11. L.S. Negi, Strength of Materials
12. S.S. Ratan, Strength of Materials

HYDRAULICS

Subject Title : HYDRAULICS
Subject Code : CE-303
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S.No	Major Topics	No. of periods	Weightage of marks	Short Type	Essay Type
1.	Properties of Fluids	04	03	1	-
2	Fluid pressure and its measurements	10	13	01	01
3.	Flow of Fluids	08	13	01	01
4.	Flow through orifice and mouth pieces	10	13	01	01
5.	Flow over notches and weirs	10	16	02	01
6.	Flow through pipes	10	18	1	11/2
7.	Flow through open channels	12	18	1	11/2
8.	Pumps& Turbines	08	13	1	1
9.	Hydro electric power plants	03	03	1	-
	TOTAL	75	110	10	08

OBJECTIVES

Upon completion of course the student shall be able to

1.0 Understand the properties of Fluids

1.1 Explain the scope and importance of hydraulics in Civil Engineering.
1.2 Define fluid
1.3 List examples of fluids.
1.4 Differentiate ideal and real fluids.
1.5 Distinguish between fluids & liquids.
1.6 Define
    1. Mass density,
    2. Specific weight,
    3. Specific gravity,

4. Adhesion,
5. Cohesion,
6. Surface tension,
7. Capillarity,
8. Compressibility,
9. Dynamic Viscosity,
10. Kinematic viscosity and
11. Vapour pressure.

1.7 State the standard Values for pure water and mercury for
1. Mass density,
2. Specific weight, and
3. Specific gravity

1.8 State the units for the above properties.

1.9 State formulae of dynamic viscosity, capillarity surface tension of water drop and soap bubble.

1.10 Explain the practical application of surface tension.

2.0 Understand methods of measurement of liquid pressure and calculate total pressure and centre of pressure on hydraulic structures

2.1 Define 1.Atmospheric pressure, 2.Gauge pressure and 3.Absolute pressure.

2.2 States the relation between the above three pressures

2.3 Describe the following pressure measuring instruments
1. Piezometers, manometers,
2. U- tube and
3. Differential manometers.

2.4 Compute the pressure of a flowing fluid given the readings on piezometers- simple manometers- differential and inverted differential manometers.

2.5 Define 1. Total Pressure and 2. Centre of Pressure.
State the formulae for total pressure and centre of pressure on the following surfaces immersed in a liquid at rest:
1. Horizontal plane,
2. Vertical plane and
3. Inclined plane

2.6 Calculate total pressure and centre of pressure for the above plane surfaces for the given conditions.

2.7 Determine total pressure and centre of pressure for hydraulic structure (like sluice gates, dams, lock gates).

3.0 Comprehend the General Principles of flow of the Liquids and Bernoulli's theorem.

3.1 State the different types of flow of liquids

3.2 Define
1.Uniform flow ,
2.Non-uniform flow,
3.Steady flow,
4.Unsteady flow,
5.Laminar flow and
6.Turbulent flow.

3.3 Distinguish between different types of flow of liquids.

3.4 Define discharge

3.5 State units of discharge

3.6 State one dimensional continuity equation.

3.7 Compute the discharge/velocity at a section of flowing liquid in pipe for the given conditions.
3.8 Explain the following energies of liquid in motion
1. Datum head,
2. Pressure head and
3. Velocity head.
3.9 State Bernoulli's theorem of total energy of a liquid in motion.
3.10 State the equation for Bernoulli's theorem of total energy of a liquid in motion.
3.11 List the limitations of Bernoulli's theorem.
3.12 Compute the pressure / velocity at a section of flowing liquid in pipe for the given conditions using Bernoulli's equation.
3.13 List three practical applications of Bernoulli's theorem ,
3.14 Describe the working principle of
1. Venturimeter,
2. Orifice meter and
3. Pitot tube.
3.15 State the formulae to calculate the actual discharge of flowing liquid through 1.Venturimeter and 2.Orifice meter.
3.16 Compute the actual discharge of flowing liquid through,
1. Venturimeter and 2.Orifice meter (numerical problems)

4.0 Comprehend the general principles of the flow of liquids through orifices and mouth pieces.

4.1 Define orifice
4.2 List different types of orifices
4.3 Differentiate large orifice and small orifice
4.4 Define
1. vena- contracta,
2. Cc,
3. Cv, and
4. Cd (Hydraulic coefficients). .
4.5 State the relation between above three coefficients.
4.6 State the formulae for actual, theoretical discharges through small orifice
4.7 Calculate the discharge, Cc, Cv ,Cd for given conditions-Numerical Problems
4.8 Derive formula for discharge through Large Rectangular Orifice.
4.9 Calculate discharge through Large Rectangular Orifice for given conditions-Numerical Problems.
4.10 State the equations with notations for discharge through
1. Fully submerged Orifice and
2. Partially submerged Orifice
4.11 Compute discharge for the above two orifices for the given conditions-Numerical problems.
4.12 State the formula for time of emptying of a prismatic tank by an orifice
4.13 Compute the time of emptying of a prismatic tank by an orifice
4.14 Define mouth piece.
4.15 Differentiate mouth piece and orifice.
4.16 Classify mouth pieces.
4.17 State the formulae for discharge for different types of mouth pieces.
4.18 Calculate discharge through a mouth piece for given data-Numerical Problems.

5.0 Comprehend the general principles of the flow of liquids over notches and weirs

5.1 Define a notch
5.2 List different types of notches.
5.3 State the formulae for the discharge over following notches:
1. Rectangular,
2. Triangular and
3. Trapezoidal notches.
5.4 Calculate the discharge through the above notches from the given data
5.5 Define weir
5.6 list different types of weirs.
5.7 State the formulae for discharge over 1. Sharp crested and 2. Broad crested weirs.
5.8 State the formulae for discharge over above weirs with modifications for end contractions and velocity of approach.
5.8 Determine the discharge over sharp crested and broad crested weirs under given conditions - Numerical Problems.
5.10 Write the formulae to determine the discharge for rectangular weir
1. Francis, and 2. Bazin's empirical formula
5.11 Determine the discharge over rectangular weir using above two formulae for given data - Numerical Problems

6.0 Comprehend the General Principles of the flow of liquids through Pipes

6.1 List various losses that occur when water flow through pipes.
6.2 Differentiate Major loss and Minor losses.
6.3 State formulae to compute loss of head due to friction using 1. Chezy, and 2. Darcy
6.4 Solve numerical problems in pipes based on the above two formulae for given data- Numerical problems.
6.5 State formulae for head loss due to various minor losses.
6.6 Compute the above minor losses of head for given data –Numerical problems.
6.7 Define
1.Hydraulic gradient line and
2.Total energy line.
6.8 Calculate discharge through Parallel and Compound (series) Pipes connected to reservoir for given data- Numerical Problems.
6.9 Define
1.Critical velocity and 2. Reynold's number.
6.10 State whether the flow is laminar or turbulent based on Reynold's number.

7.0 Design a section of open channel flow

7.1 Define open channel flow
7.2 Differentiate open channel flow and pipe flow
7.3 Define
1. Wetted perimeter and
2. Hydraulic mean depth/radius.
7.4 State
1.Chezy's formula and

2.Manning's formula
for uniform flow through open channels

7.5 List the Values of 'C' for different surfaces.

7.6 State the following formulae to evaluate 'C'
1.Kutter's, formula,
2.Manning's formula and
3.Bazin's formula

7.7 Calculate Velocity and Discharge in a channel using Chezy's and Manning's formulae for given conditions-Numerical problems.

7.8 Define most economical section of a channel.

7.9 List the conditions for most economical section of
1.Rectangular channel and
2.Trapezoidal channel

7.10 Design rectangular channel sections for the given conditions

7.11 Design trapezoidal channel sections for the given conditions

8.0 Understand the working principles of pumps and water turbines

8.1 Define Pump

8.2 List different types of Pumps

8.3 Describe the parts of Reciprocating Pump with a sketch.

8.4 Describe the working principle of
1.Single acting and 2.Double acting reciprocating pumps.

8.5 List the functions of air vessels for reciprocating pumps.

8.6 Describes the different parts of centrifugal pumps.

8.7 Explain the working principle of centrifugal pump.

8.8 Define priming

8.9 Explain the necessity of priming.

8.10 Explain the use of
1.Foot valve and 2.Strainer in a centrifugal pump.

8.11 Describe
1. Jet pump
2. Air lift pump and
3. Deep well pump

8.12 List the uses of
1. Jet pump
2.Air lift pump and
3.Deep well pump

8.13 Define Turbine

8.14 List types of turbines.

8.15 List the examples of
1. Impulse and 2. Reaction turbines.

8.16 Differentiate between Impulse and Reaction turbines.

8.17 Explain the working principle of Pelton wheel turbine.

8.18 Describe the Parts of Francis Turbine.

8.19 Explain the purpose of draft tube

8.20 List types of draft tubes.

9.0 Understand the functions of components of Hydro-Electric Power Plants

9.1 Sketch a typical layout of hydro-electric power plant installation.

9.2 List different components of hydro-electric power plant installation.

9.3 Define surge tank

9.4 List the functions of surge tank.

COURSE CONTENT

1.0 Properties of liquids

a) Scope and importance of hydraulics in Civil Engineering
b) Fluids – classification - ideal and real fluids.
c) Difference between fluids and liquids.
d) Properties of liquids.
e) Formulae for Dynamic viscosity, Kinematic viscosity, surface tension of water and soap bubble, capillarity.

2.0 Liquid pressure and its measurement

(a) Atmospheric pressure, gauge pressure and absolute pressure and relationship.
(b) Pressure measuring Instruments – Piezometer- Manometers – U-tube, inverted U-tube and differential manometers -Description.
(c) Measurement of the Pressure of a flowing liquid – Piezometer - simple, differential and inverted differential manometers.
(d) Total pressure and Centre of pressure on plane surface immersed in liquid – i) Horizontal ,ii) Vertical iii) inclined plane surfaces and Practical Applications.
(e) Numerical Problems on Total pressure and Centre of pressure.

3.0 Flow of liquids

(a) Types of Flow – Uniform flow, non-uniform flow, stream line flow, turbulent flow, steady flow and unsteady flow.
(b) Rate of flow or discharge-continuity equation – one dimensional – Principle - Numerical Problems.
(c) Energies of liquid in motion – datum head – pressure head and velocity head.
(d) Total energy of liquid in motion – Bernoulli's theorem (without proof) - limitations of Bernoulli's theorem - Numerical Problems.
(e) Practical applications of Bernoulli's theorem - venturi meter - orifice meter - pitot tube.
(f) Numerical Problems on venturi meter and orifice meter.

4.0 Flow through Orifices and Mouth Pieces

(a) Orifice-types of Orifices-difference of small and large orifice-Determination of discharge through small Orifice - Vena Contracta.-Hydraulic coefficients (Cv,Cc,Cd) – relation -(No derivation) - Numerical Problems.
(b) Large Rectangular Orifice- Derivation of formula for discharge- Numerical Problems.
(c) Flow through fully submerged and partially submerged orifices-explanation-formula for discharge- Numerical Problems.
(d) time of emptying of a prismatic tank by an orifice- Numerical Problems.
(e) Mouth piece-Difference between Orifice and Mouth piece.
(f) Types of Mouth pieces – equations for discharge-determination of discharge through a Mouth piece from the given details.

5.0 Flow over Notches and Weirs

Notches

(a) Notch - types of notches - rectangular, triangular and trapezoidal notches

(b) Formulae for the discharge over rectangular, triangular and trapezoidal notches-Numerical problems (Derivation of formulae not required)

Weirs

(c) Weir - types of weirs – sharp crested and broad crested weirs

(d) Formulae for the discharge over a sharp crested and broad crested weirs - Numerical problems (Derivation of formulae not required)

(e) Equations of discharge for the above weirs with velocity of approach and end contractions.

(f) Empirical formulae for discharge over rectangular weir-Francis formula-Bazins formula- Numerical problems (Derivation of formulae not required).

6.0 Flow thorough pipes

a) Major and minor losses.

b) Frictional loss in pipes - Chezy's formula and Darcy's formula (without proof) - Numerical problems.

c) Minor Losses - Loss of head at entrance and exit of pipe, loss of head due to sudden enlargement, sudden contraction – Formulae - simple problems.

d) Hydraulic gradient and total energy line.

e) Discharge through parallel pipes and compound pipes (series) connected to a reservoir.

f) Laminar and turbulent flow in pipes - critical velocity and Reynold's number – significance (no problems).

7.0 Flow through open Channels

a) Open channel flow - differences between open channel flow and pipe flow.

b) Geometric properties of channel - Wetted perimeter and hydraulic mean depth.

c) Discharge through open channel –Chezy's formula (derivation not necessary).

Numerical problems

d) Value of 'C' for different surfaces.

e) Empirical formulae for value of C.

1. Kutter's formula.
2. Manning's formula
3. Bazin's formula.

f) Conditions for Most economical section of a channel-rectangular and trapezoidal sections - Design of cross sections- problems.

8.0 Pumps and Turbines

Pumps

a) Pumps – types - reciprocating pumps and centrifugal pumps.

b) Reciprocating pumps- singe acting and double acting pumps- description and working – functions of air vessels.

c) Centrifugal pumps-description of parts – working – priming.

d) foot valve and strainer.

e) Other type of pumps-jet, airlift and deep well pumps – brief description - uses.

Turbines

a) Classification of turbines-impulse and reaction turbines.

b) Impulse turbine -Pelton Wheel, description and working(without problems)

c) Reaction turbines- Francis and Kaplan turbines

d) Description and working of Francis turbine (without problems).
e) Draft tube- purpose and types.

10.0 Hydro-electric Installation

a) Sketch a typical layout of a hydro electric power plant - components – Intake works, Pressure tunnel, penstock, surge tank, anchor blocks and tailrace.
b) Functions of surge tank.

REFERENCE BOOKS

1. Reya & Rao, Hydraulics
2. Modi & Sethi, Hydraulics & Fluid Mechanics
3. Bansal, Fluid Mechanics &Hydraulics
4. Fluid Mechanics and Hydraulic Machines

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SURVEYING – II

Subject Title : Surveying – II
Subject Code : CE-304
Periods/Week : 03
Periods/Semester : 45

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Leveling	30	68	6	5
2.	Theodolite Survey	15	42	4	3
	Total	45	110	10	8

OBJECTIVES

Upon completion of this course student shall be able to

1.0. Understand the principles of levelling for different engineering purposes

1.1. Define levelling
1.2. List the types of levelling instruments
1.3. Define
   1. Datum or Datum plane,
   2. Reduced level,
   3. Level surface,
   4. Horizontal surface,
   5. Vertical Line and
   6. Station.
   7. Mean sea level
   8. Bench Mark
1.4. List the component parts of a dumpy level and their functions
1.5. List the temporary adjustments of a dumpy level.
1.6. Explain the steps involved in performing Temporary adjustments of a dumpy level.
1.7. Define
   1. Back sight,
   2. Fore sight,
   3. Intermediate sight,
   4. Change Point
1.8. List types of levelling staves
1.9. List the Errors in levelling
1.10. Enumerate 1. Natural and 2. Instrumental errors
1.11. List the Precautions to be taken to prevent errors in levelling
1.12. Tabulate the levelling field data
1.13. State two types of methods of reducing levels

1.14. Compare height of instrument and Rise and fall methods
1.15. Compute reduced levels by height of instrument and Rise and fall methods, and apply check
1.16. Explain the effect of Errors due to
1. Curvature and 2. Refraction
1.17. Compute the error due to
1. Curvature,
2. Refraction and
3. Combined error. and the
1.18. Apply correction to be applied for the above errors.
1.19. List the types of Levelling
1.20. Describe in detail 1. Profile levelling and 2. Reciprocal levelling
1.21. List the errors eliminated in reciprocal levelling
1.22. Derive the formula for true difference in elevation and true error between two points in reciprocal levelling
1.23. Calculate true difference in elevation in reciprocal levelling and collimation error in reciprocal levelling
1.24. Calculate collimation error in reciprocal levelling
1.25. List the fundamental lines of dumpy level
1.26. state the relationship among fundamental lines of dumpy level
1.27. Explain permanent adjustments of a dumpy level (one peg method only)
1.28. Define
1. Contour,
2. Contour interval and
3. Horizontal equivalent
1.29. List the Characteristics
1.30. List the uses of contours
1.31. List the methods of contouring
1.32. Describe Block contouring and radial contouring
1.33. Describe Radial contouring
1.34. Explain the interpolation of contours
1.35. Explain the method of tracing contour gradient / alignment of hill road

2.0. Understand the principles of theodolite surveying

2.1. List the uses of a theodolite
2.2. List the types of theodolites
2.3. Differentiate between transit and non transit theodolites
2.4. List the parts of a transit theodolite
2.5. Explain the functions of parts of a transit theodolite.
2.6. Define
1. Face left observation,
2. Face right observation,
3. Swing of telescope,
4. Telescope normal and
5. Telescope inverted
2.7. List the fundamental lines of a transit thedolite
2.8. Explain the relationship of fundamental lines of theodolite
2.9. Explain the method of temporary adjustments of a transit theodolite for taking observations.
2.10. Read the reading of vernier and least count

2.11. Explain the method of measuring the horizontal angle by repetition method
2.12. Rule out the page of a theodolite field book
2.13. Calculate the angle by the method of repetition
2.14. List the errors eliminated in repetition method
2.15. Explain the method of measuring of horizontal angle by reiteration method
2.16. Rule the page of a theodolite field book
2.17. Explain the method of calculating angles by method of reiteration
2.18. Explain the method of measurement of
1. Direct angles and
2. Deflection angles
2.19. Explain the Steps involved in setting out angles using a theodolite.
2.20. Explain the method of measurement of Vertical angles
2.21. Explain the method of measurement of magnetic bearing of a line
2.22. Explain the methods of prolonging a given survey line
2.23. Explain the method of conducting traverse survey by
1. Included angles method,
2. Deflection angles method and
3. Magnetic bearing method
2.24. Check the angular measurements and apply corrections in a closed traverse
2.25. Define 1. Latitude and 2. Departure of a line
2.26. Compute the latitudes and departures of survey lines of a closed traverse
2.27. Calculate the error of closure of a closed traverse
2.28. List the following omitted measurements of a closed traverse
1. Length and bearing of one side,
2. Length of one side and bearing of another side,
3. Length of two sides and
4. Bearing of two sides
2.29. Calculate the omitted measurements when Length and bearing of one side only is omitted.
2.30. Balance the closing error by
1. Bowditch rule and
2. Transit rule.
2.31. Enumerate the difference between consecutive and independent co-ordinates
2.32. Calculate the consecutive and independent co-ordinates of stations of a closed traverse
2.33. Calculate the area of a closed Traverse by independent co-ordinates
2.34. List the types of errors in theodolite surveying.

COURSE CONTENT

1. Levelling

a) Levelling – Types of levelling instruments – component parts of a dumpy level and their functions – Definitions of important terms used in Levelling – level surface, level line, plumb line, horizontal line, axis of telescope, line of collimation, back sight, fore sight, intermediate sight, station and change point – Temporary adjustments of a dumpy level – types of Levelling Staves

b) Bench marks – different types of bench marks

c) Booking of readings in field book – Determination of Reduced levels by height of instrument and Rise and Fall methods – Comparison of methods – Problems.
d) Errors in levelling – natural and instrumental errors – Precautions
e) Errors due to curvature and refraction and combined correction – problems
f) Classification of Levelling – detailed description of profile levelling and reciprocal levelling – Problems on Reciprocal levelling.
g) Contouring – contour, contour interval and horizontal equivalent – Characteristics of contours – methods of contouring – Block contouring – Radial contouring – interpolation of contours – uses of Contour maps – tracing of contour gradient or alignment of a hill road – Marking alignment of roads, railways and canals.
h) Fundamental lines of dumpy level and their relations – Permanant adjustments of a dumpy level (one peg method without problems)

2. Theodolite

a) Principles of theodolite surveying
   i. Component parts of a transit theodolite and their functions – Definitions of technical Terms – Station, face left, face right, swinging the telescope, transiting.
   ii. Fundamental lines of a transit theodolite – Horizontal axis, vertical axis, axis of telescope, axis of plate levels, axis of altitude bubble, line of collimation – Conditions of adjustments.
   iii. Temporary adjustments of a transit theodolite.
   iv. Measurement of horizontal angles by repetition and reiteration method
   v. Measurement of vertical angles
   vi. Booking readings
   vii. Measurement of magnetic bearings, deflection angles, direct angles – Prolonging a straight line – by single transiting, double transiting and fore sighting methods
   viii. Errors in theodolite work.

b) Theodolite Traversing
   i) Traversing with theodolite by included angles method, deflection angles method and magnetic bearing method.
   ii) Checks for closed and open traverse.
   iii) Traverse computations – Latitude and departure – closing error – balancing a closed traverse by Bowditch rule and transit rule – omitted measurements in a closed traverse – problems on omitted measurements (Length and bearing of one side only omitted) – consecutive and independent coordinates - area of closed traverse.

REFERENCE BOOKS

1. Dr. B.C.Punmia, Surveying - I & II
2. S.K. Husain, Surveying
3. P Kanetkar, Surveying and levelling - I & II
4. A.V.R.J. Sharma and Kamala, Surveying - I & II
5. Dr.C.Venkat Ramaiah, Text book of surveying

CONSTRUCTION MATERIALS

Subject Title : Construction Materials
Subject Code : CE-305
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Stones	07	13	01	01
2.	Bricks	07	13	01	01
3.	Clay products & Sand	08	16	02	01
4.	Cement	07	13	01	01
5.	Mortars & Concrete	16	26	02	02
6.	Surface protective materials	07	13	01	01
7.	Timber, Plastics, Glass & Asbestos	08	16	02	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand selection of stones and their acceptability for construction work

1.1 Classify rocks (Physical classification only)
1.2 List the characteristics of good building stone.
1.3 List the common varieties of stone used in different items of construction and their suitability for construction works (like Granite, marble, Kadapa slabs, Shahabad stones)
1.4 Explain the purpose of dressing stones.

2.0 Understand the acceptability of bricks for construction work

2.1 State common sizes of bricks – IS specifications.
2.2 List the steps involved in the manufacture of bricks.
2.3 Explain the need for burning bricks.
2.4 Explain the method of burning bricks in a continuous kiln.
2.5 List the characteristics of good bricks.
2.6 List the standard tests on bricks
2.7 Explain the followings tests conducted on bricks
1. Water absorption and 2. Compressive strength

2.8 Explain the uses of the following types of bricks for construction purposes -
1.Refractory bricks,
2. Fly ash bricks,
3. Precast Solid Concrete Blocks,
4. Hollow concrete blocks, and
5. High quality building blocks.

3.0 Understand suitability of tiles, pipes and building sand for Construction

3.1 State the common variety of tiles used for different purposes.
3.2 List the characteristics of good tiles.
3.3 List the uses of porcelain and glazed tiles.
3.4 State the uses of stone ware pipes.
3.5 List the characteristics of good sand.
3.6 State the functions of building sand.
3.7 State the percentage of bulkage allowance for construction work.
3.8 State the need for the quarry dust as a substitute of sand.

4.0 To check the quality of cement for construction work

4.1 State the chemical composition of cement.
4.2 State rough and ready methods of examining cement
4.3 Explain the method of manufacture of cement by dry process only.
4.4 Classify cements
4.5 List the uses of various cements
4.6 State the standard tests for cement.
4.7 Explain the following tests on cement
1. Fineness,
2. Consistency,
3. Setting times and
4. Soundness of cement.
4.8 State grades of cement and their compressive strengths.
4.9 State the importance of blended cement
4.10 Explain the application of blended cement with fly ash and blast furnace slag.

5.0 Understand the principles of preparation of mortars and Concrete

5.1 Explain 1.Fine aggregate and 2.Coarse aggregate.
5.2 Explain the purpose of water absorption and sieve analysis tests conducted on fine and coarse aggregate.(Procedure of tests not necessary).
5.3 Classify mortars.
5.4 List the different proportion of mortars for various works.
5.5 Explain the method of preparation of cement mortar
5.6 Explain the use of super plasticiser for improving workability and higher strength.
5.7 List the ingredients of 1.Plain concrete and 2.Reinforced concrete.
5.8 State the usual proportions of plain and reinforced concrete for different items of work.
5.9 Define
1. Hydration of cement
2. Water cement ratio
3. Workability

4. Curing

5.10 Explain the importance of 1.Hydration of cement and 2.water cement ratio.

5.11 Explain the method of preparing concrete.

5.12 List the steps involved in the procedure of mixing, conveyance, placing, and compaction and curing of concrete.

5.13 List different curing compounds

5.14 List the methods of curing suitable for different surfaces.

5.15 List different tests conducted for determining the workability of concrete

5.16 Explain the procedure of conducting the following tests on concrete
1. Slump test, and
2.Compressive strength

5.17 List the types of admixtures used in concrete

5.18 List uses of admixtures used in concrete.

5.19 Explain about ready mix concrete.

5.20 List the advantages and disadvantages of ready mix concrete.

5.21 List the uses of the following materials for improved durability and better resistance to adverse exposure conditions.
1. Fly ash,
2. Quarry dust

6.0 Understand the selections and applications of Surface Protective Materials

6.1 Give the composition of
1. Paints,
2. Enamels and
3. Varnishes.

6.2 List the types of the following surface protective materials:
1. Paints,
2. Enamels,
3. Varnishes,
4. Distempers,
5. Emulsion,
6. French polish and
7. Wax Polish.

6.3 List the uses of surface protective materials

7.0 Understand the selections and applications of Wood, Plastics, Glass and Asbestos for construction work

7.1 List the characteristics of good timber.

7.2 Define seasoning.

7.3 Explain the importance of seasoning of timber

7.4 Name the common varieties of timber used in A.P for various Civil Engineering work.

7.5 State various types of wood products used in construction work.

7.6 List the uses of wood products used in construction work.

7.7 List the uses of fibre reinforced plastic.

7.8 List merits and demerits of plastics.

7.9 List the merits and demerits of asbestos products.

7.10 Explain suitability of different types of glasses as a building material.

7.11 List the merits and demerits of glass.

7.12 Explain suitability of Powder coated Aluminium and Steel sheets as building material.

COURSE CONTENT

1) Stones

a) Classification of rocks, physical classification.
b) Characteristics of good building stone.
c) Common varieties of stones-granite, marble, Kadapa slab, Shahabad stones.
d) Dressing of stones – purpose.

2) Bricks

a) Method of manufacture of bricks – continuous kiln process
b) ISI specification for bricks IS-1077-1971.
c) Characteristics of good bricks.
d) Testing of bricks as per IS-3495-1966 – tests on water absorption and compressive strength of bricks.
e) Refractory bricks and their uses.
f) Fly ash bricks.

3) Clay products & Sand

a) Tiles –Types of tiles roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Morbonite.
b) Characteristics of good tiles.
c) Porcelain – glazed tiles (uses only).
d) Stone ware pipes – uses.
e) Characteristics of good sand, Functions of sand.
f) Bulking of sand – percentage of bulking – bulk age allowance to be permitted.
g) Crushed stone powder as substitute of sand.

4) Cement

a) Chemical composition of cement.
b) Rough and ready method of testing cement.
c) Methods of manufacture of cement – Dry process.
d) Classification of cement – ordinary Portland cement, quick setting cement, white cement –Rapid hardening cement, Low heat cement, High alumina cement, Blast furnace slag cement and Pozzolana cement – uses of different types of cement.
e) Tests for cement as per ISI – fineness, consistency, setting time, soundness tests.
f) Blended cement.

5) Mortars & Concrete

a) Fine aggregate and course aggregate – Water absorption and sieve analysis of fine and coarse aggregates.
b) Mortar – Classification of mortar – Lime mortar, cement mortar, Surkhi mortar, Blended mortar.
c) Different proportions of mortars for various works.
d) Preparation of cement mortar.
e) Ingredients of plain concrete.
f) Proportioning – usual proportions for different item of work. Foundation, Footings, Columns, Slabs & Beams for ordinary buildings.
g) Plain concrete and reinforced concrete.
h) Water cement ratio – factors effecting water cement ratio.

i) Workability – Slump test on fresh concrete, hardened concrete – compressive strength test on hardened concrete.

j) Admixtures – definition – types – 1) Chemical admixtures – Plasticizers (water reducers), super plasticizers, air entraining agents, accelerators, retarders and bonding admixtures – 2) Mineral admixtures – i) Pozzolanas - fly ash, ground granulated blast furnace slag, silica fume, rice husk ash and metakaoline – ii) Gas forming – Powered zinc, powdered aluminium and hydrogen peroxide – uses.

k) Method of preparation of concrete – Hand and machine mixing.

l) Procedure of mixing, conveyance, placing compaction, and curing of concrete.

m) Curing –different curing compounds - methods – suitability

n) Introduction to ready mix concrete – Advantages and disadvantages.

o) Use of fly ash, quarry dust.

6) Surface Protective Materials

a) Composition of Paints, enamels, varnishes.

b) Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish.

7) Timber, Plastics, Glass and Asbestos

a) Characteristics of good timber.

b) Seasoning of timber – Importance.

c) Common varieties of timber used for different items of work – Doors and windows, form work, centring with particular references of A.P.

d) Wood products-veneer – Ply wood, particle board, laminated board, straw board – Eco board.

e) Types of plastics – fibre reinforced plastics for plastic doors and windows and water tanks.

f) Use of asbestos – manufacture of asbestos sheets and pipes .

g) Types of glasses and uses.

REFERENCE BOOKS

1. S. Unnnikrishna Pillai & Devdas Menon, Reinforced Concrete Design (Third edition) (McGraw Hill Education (India) Private Limited)
2. C B R I, Building materials & components
3. Kulakarni, Building materials
4. N.Sreenivasulu, Construction materials
5. Duggal S. K, Building Materials
6. S.P. Arora & S. P. Bindra, Building Material & Construction

CONSTRUCTION PRACTICE

Subject Title : Construction Practice
Subject Code : CE-306
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. NO.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Classification of buildings and Foundations	12	26	02	02
2.	Masonry	07	13	01	01
3.	Doors, Windows and Lintels, Sunshades	07	13	01	01
4	Roofs and Floorings	11	16	02	01
5	Scaffolding and Stair Cases	07	13	01	01
6.	Protective, decorative finishes and Termite proofing	08	16	02	01
7.	Energy management and Energy audit of building	05	10	-	01
8.	Solar energy utilization in buildings	03	03	01	-
	Total	60	110	10	08

OBJECTIVES

Upon completion of course the student shall be able to

1.0 Know the classification of Buildings and design of foundations as per NBC

1.1 List the components of a building
1.2 Explain the functions of the components of a building
1.3 Classify the buildings according to National Building Code with examples.
1.4 Explain the investigations required for foundation as per N.B.C.
1.5 Describe the following with line diagrams –
  1. Spread footings,
  2. Raft foundation,
  3. Pile foundation and
  4. Well foundation.
1.6 Explain the following terms:
  1. Bearing capacity of soil,

2. Safe bearing capacity of soil. and
3. Ultimate bearing capacity of soil.

1.7 State the loads to be considered in design of foundation.

1.8 List rules for minimum depth, width of foundation and thickness of concrete bed for spread footing foundation.

1.9 Explain the method of constructing spread footing foundation.

1.10 List the causes of dampness at basement level.

1.11 List the effects of dampness at basement level

1.12 List the measures for prevention of dampness at basement level.

2.0 Understand the construction of masonry work

2.1 List different types of stone masonry.

2.2 Explain the different types of stone masonry.

2.3 State the general principles to be observed in stone masonry construction

2.4 Explain the following terms in brick masonry.:
1. Bond,
2. Course,
3. Header, and
4. Stretcher

2.5 List general principles of brick masonry.

2.6 Explain with sketches, English bond for alternate layers brick masonry of various wall thicknesses.

2.7 Explain masonry with Precast concrete solid blocks, Hollow blocks, high quality building blocks maintaining bond with sketches.

3.0 Understand the types and principles of doors, windows, ventilators, Lintels and sunshades

3.1 State the principles of locating doors, windows and ventilators in buildings.

3.2 Explain with sketches common and special types of doors, windows and ventilators.

3.3 List the uses of different types of doors, windows and ventilators.

3.4 Explain the fittings and fastenings of doors, windows and ventilators.

3.5 Explain the functions and types of lintels.

3.6 Explain the functions of sunshades, canopy, sun-breakers and porticos.

3.7 Explain about thin lintel developed by CBRI with simple sketches.

4.0 Understand methods of construction and finishes of different types of roofs and floorings

4.1 State the functions of roofs.

4.2 State the classification of roofs.

4.3 State the classification of trusses based on material and shape.

4.4 Explain with sketches king post truss, queen post truss, fan roof truss, north light roof trusses.

4.5 Explain with sketches A type, B type steel trusses using structural angles and tubular sections as per the provisions of IS code.

4.6 State the common and decorative ceilings used in construction work.

4.7 Explain the method of fixing Plaster of Paris and fibre glass ceilings.

4.8 State the component parts of flooring.

4.9 State the functions of flooring.

4.10 List the requirements of good floor.

4.11 Explain method of construction of C.C flooring, stone slab flooring, tiled flooring, mosaic flooring, Ceramic flooring, and Marble flooring.

5.0 Understand scaffolding and types of Stair cases

5.1 State the purpose of scaffolding.
5.2 Define scaffolding and mention the types.
5.3 List the component parts of tubular scaffolding.
5.4 Sketch and explain about tubular scaffolding.
5.5 State the advantages of tubular scaffolding.
5.6 State the principles of locating stairs.
5.7 Explain terms: rise, tread, landing, flight, going, hand rail, newal post, baluster and balustrade.
5.8 Draw the line diagrams of different stairs.

6.0 Understand Protective, decorative finishes and Termite Proofing

6.1 State the objects of plastering.
6.2 State the methods of plastering.
6.3 State the steps in providing cement plastering on masonry walls.
6.4 State the use of wall putty as a decorative finish on masonry walls.
6.5 State the objects of pointing.
6.6 State the types of pointing.
6.7 State the objects of painting.
6.8 Explain the method of painting new and old walls surfaces.
6.9 State the paints suitable for painting wood work and steel work.
6.10 Explain briefly the method of white washing, colour washing, distempering the brick masonry wall.
6.11 Define termite proofing.
6.12 Explain the method of termite proofing.

7.0 Appreciate the concept of energy management and energy audit of buildings

7.1 Explain the possible ways of energy management in buildings.
7.2 State the aims of energy management of buildings.
7.3 Distinguish among energy auditing schemes.
7.4 State the response to audit questionnaire.
7.5 Explain energy surveying and audit report.
7.6 Formulate the energy flow charts.

8.0 Understand the concept of solar energy utilization in buildings

8.1 Explain the passive concepts in heating and cooling.
8.2 List the various solar energy utilities like solar water heaters, solar air heaters, solar cookers and solar PV panels.

COURSE CONTENT

1) Classification of Buildings and foundations

a) Component parts of a building –Their functions.
b) Classification of buildings according to National building code.
c) Site investigation for foundation as per N.B.C, Trial pit, auger boring.
d) Bearing capacity of soils –safe and ultimate bearing capacity.
e) Spread footing foundation for columns and walls.
f) Raft foundation.

g) Pile foundation – RCC Piles – Bearing piles, friction piles and under reamed pile.
h) Well foundation – component parts – sinking of well foundation.
i) Different loads to be considered for the design of foundation as per IS 875 – 1987.
j) Spread foundation – Depth of foundation by Rankin's formulae– width of foundation – Thickness of concrete bed.
k) Construction of foundation – (spread footing foundation only).
l) Causes, effects and prevention of dampness at basement level.

2) Masonry

a) Classification of stone masonry – Ashlar, Random rubble and Coursed Rubble Masonry – general principles to be observed while constructing stone masonry
b) Brick Masonry – Bonds in brick masonry – (English bond only) for various wall thicknesses – General principles to be observed in construction of brick masonry.

3) Doors, Windows, Lintels and Sunshades

a) Doors and windows – parts of door window – positioning.
b) Common types of doors-panelled, Glazed and Flush doors.
c) Special types of doors – Flush doors with modern construction materials, revolving doors, collapsible doors, rolling shutters, sliding doors, referring to A.P.D.S.S for size of doors and windows.
d) Windows – Panelled and Glazed.
e) Ventilators – fixed, swinging type and louvered.
f) Fittings and fastenings for doors and windows.
g) Lintels – Functions – Types of lintels – R.C.C., wood, stone and steel.
h) Sunshade, canopy and sun breakers – lintel cum sunshade.

4) Roofs and Floorings

a) Roof – functions of roofs.
b) Classification of roofs – flat roofs – pitched roofs.
c) Different types of trusses – classification based on material and shape king post truss, queen post truss, fan roof truss, north light roof truss, steel trusses of A type and B type using angular and tubular sections as per IS code.
d) Weather proof course on R.C.C. roof.
e) Decorative ceilings for auditoriums – method of fixing Plaster of Paris –Fibre glass.
f) Parts of flooring – Requirements of a good floor.
g) Methods of constructing flooring – cement concrete flooring, stone slab (Kadapa slab, Shahabad stone) floorings, cement plaster flooring, Tiled flooring, mosaic flooring.

5) Scaffolding, Stairs and staircases

a) Scaffolding – Purpose and types – tubular scaffolding only.
b) Location of stairs.
c) Types of different stairs – straight, Quarter turn, half turn, Dog legged, open well, bifurcated, spiral/helical stair case, free standing and slab less stairs/staircase.

6) Protective, decorative finishes and Termite proofing

a) Plastering – purpose – Types of plastering – procedure for plastering. external finishing – sand faced, pebble dash, acoustic plastering and marble chips – Internal finishing – wall paper and wall putty finishing.
b) Pointing – purpose –Types of pointing
c) Painting – objects – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces.
d) White washing – colour washing – Distempering – internal and external walls.
e) Termite proofing – method.

7) Energy Management and Energy Audit of Buildings

a) Introduction to Energy Management and Energy Audit of Buildings
b) Aims of energy management of buildings
c) Types of energy audit
d) Energy audit questionnaire
e) Response
f) Energy surveying and audit report
g) Energy flow charts

8) Solar Energy Utilization in Building

a) Passive concepts – Heating and cooling concepts
b) Solar energy utilities – Solar water heaters, solar air heaters, solar cookers and solar PV panels.

REFERENCE BOOKS

1. N.B.C, National Building code
2. S.P. Arora & S.P. Bindra, Building Construction
3 Sushil Kumar, Building Construction
4. S.C.Rangawala, Building Construction
5. Explanatory handbook on Masonry code, SP20
6. Nainan P. Kurian, Design of foundation structures principles and practice

CIVIL ENGINEERING DRAWING-I

Subject Title : Civil Engineering Drawing - I
Subject Code : CE-307
Periods/Week : 06
Periods/Semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Introduction	9	08	02	-
2.	Residential Buildings	45	24	1	1
3.	Public and Industrial Buildings	21	28	1	1
4	Working drawings	15		1	
	Total	90	60	05	02

Note: All questions are to be answered. Part-A 5X4=20 marks & Part-B 2X20=40 marks

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Apply standard practices in drawing different components of building

1.1 Sketch the conventional signs of
1. Civil Engineering materials,
2. Plumbing and
3. Electrical fixtures.

1.2 Draw the cross section of load bearing wall and name all components below and above ground level.

1.3 Draw the plan of one Brick wall meeting at corner showing alternative courses of header and stretchers in English bond.

1.4 Draw the following views of a fully panelled door and label the parts
1. Elevation and
2. Sectional plan

1.5 Draw the following views of fully panelled window and glazed window and label the parts.
1. Elevation and
2. Sectional plan

1.6 Draw the following views of glazed window and label the parts.
1. Elevation and
2. Sectional plan

1.7 Draw the elevation of the following trusses and label the parts with the given data(details of joints not required)
1. King post truss and
2. Queen post truss

2.0 Understand the requirements of setbacks and orientation principles for planning residential buildings as per local bye laws and NBC

2.1 Draw the site plan of a residential building as per local bye-laws.

2.2 Draw the following views of single storyed load bearing type residential building from the given line diagram and set of specifications for
A) One room with veranda B) one bedroom house C) two bedroom house
1. Plan,
2. Section and
3. Elevation

2.3 Draw the following views of single storied framed structure type residential building from the given line diagram and set of specifications for
A) one bedroom house B) two bedroom house
1. Plan,
2. Section and
3. Elevation

2.4 Draw the following views of a dog legged stair with given specifications.
1. Plan, and
2. Section

2.5 Draw the following views of two- storied residential building (framed Structure) from the given the line diagram and set of specifications.
1. Plans of first and second floors and
2. Elevation

2.6 Prepare the drawings in the standard format for obtaining sanction from a local body for a residential building (Two storyed, two bed room building) including a rain water harvesting structure

3.0 Draw the line diagrams (to a scale) of public and Industrial buildings

3.1 Rural hospital of 10 beds capacity
3.2 Hostel for 50 students
3.3 Primary school of 250 to 300 students
3.4 Apartments - Plan of one floor with 6 to 10 units @ 90 –150 sq.m /unit

4.0 Working drawings

4.1 Prepare a working drawing for the purpose of marking the width of foundation for the given plan of a building

4.2 Calculate the following for the given plan of a building
1. Plinth area,
2. Carpet area and
3. Floor area ratio/ Floor spaces Index.

COURSE CONTENT

1.0 Introduction

1.1 Conventional signs for materials like bricks, stone, concrete, wood, glass, earth, steel and electrical fixtures like ceiling fan, bulb, main switch, refrigerator, bell push, buzzer, A.C motor, and water supply and sanitary fixtures like tap, wash basin, sink, W.C pan (Indian and European type), shower, flush tank.

1.2 Cross section of a load bearing wall showing all the components below and above the ground level.

1.3 Plan of one brick wall meeting at a corner showing odd and even courses in English bond,

1.4 Plan and Cross section of a Fully panelled door

1.5 Plan and Cross section of a Fully panelled window and glazed window showing all the component parts

1.6 Elevation of King post and Queen post trusses with the given Data (details of joints not required)

2.0 Residential Buildings

2.1 Setbacks and orientation principles for planning residential buildings as per local bye laws and NBC

2.2 Single storied two bed room load bearing residential building

2.3 Single storied framed structure two bedroom residential building

2.4 Two-storied residential building (framed structure type)

2.5 Dog legged stair

2.6 The standard format for obtaining sanction from local body for a residential Building (up to two bedroom building–G+1 floors) including a rainwater harvesting structure.

3.0 Public and industrial buildings

Draw the line diagrams only showing the functional requirements of

3.1 Rural hospital of 10 beds capacity

3.2 Hostel for 50 students

3.3 Primary school of 250 to 300 students

3.4 Apartments - Plan of one floor with 6 to 10 units @90 – 150 sq.m / unit

4.0 Working drawings

4.1 Working drawing for the purpose of marking from the given plan and width of foundation.

REFERENCE BOOKS

1. Chakraborthy, Civil Engineering Drawing-I
2. N.Srinivasulu, Civil Engineering Drawing-I

SURVEYING –II Practice

Subject Title : SURVEYING –II Practice
Subject Code : CE-308
Periods/Week : 06
Periods/Semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Levelling	36
2.	Theodolite Survey	24
3.	Plotting	30
	Total	90

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Perform different methods of levelling

- 1.1 Identify the component parts of a dumpy level / Auto level
- 1.2 Study different types of levelling staves
- 1.3 Perform temporary adjustments of a dumpy level / Auto level for taking observations
- 1.4 Practice taking staff readings and recording them in level field book
- 1.5 Take staff readings for differential levelling
- 1.6 Compute the difference in elevation between two stations (take invert levels also)
- 1.7 Conduct fly levelling and determine RLs of required stations
- 1.8 Determine the true difference in elevation between two far off stations by conducting reciprocal levelling
- 1.9 Determine the collimation error of a dumpy level by conducting reciprocal levelling
- 1.10 Conduct profile levelling along a route and compute the RLs at various stations
- 1.11 Conduct profile levelling by taking cross sections across a route and compute the RLs at various stations
- 1.12 Conduct profile levelling along a route by taking readings along both LS and CS and compute the RLs
- 1.13 Conduct block levelling for the given area
- 1.14 Locate the contour Points by direct (Radial) method in the field

2.0 Perform Theodolite Surveying

2.1 Identify the component parts of a theodolite
2.2 Perform temporary adjustment of theodolite.
2.3 Measure horizontal angles
2.4 Record the observations in the field book.
2.5 Measure horizontal angle by repetition method
2.6 Measure horizontal angles by reiteration method
2.7 Measure Vertical angles
2.8 Prolong a given survey line by double transiting method
2.9 Measure the horizontal distance between two inaccessible points using theodolite
2.10 Measure bearing of a survey line
2.11 Conduct theodolite traversing (closed),
2.12 Compute latitudes and departures
2.13 Calculate the area of traverse

3.0 Plotting

3.1 Plot the LS and CS along a route from the data of profile levelling,
3.2 Mark the formation level by selecting suitable gradient,
3.3 Calculate the depth of cutting and filling
3.4 Prepare the Contour map from block levelling by interpolation
3.5 Measure the horizontal distance between two inaccessible points by plotting the data observed in theodolite survey
3.6 Plot the closed traverse of theodolite, distribute the closing error by Bowditch / transit rule
3.7 Calculate the area of traverse

KEY Competencies to be achieved by the student

S.No	Experiment Title	Competency	Key Competency
1	Study of dumpy level / Auto level	Hold the instrument and fix on tripod Identify parts and their functions	Spread the tripod on ground properly for easy levelling and stability. Operate foot screws, Adjust eyepiece Focus the object glass
2	Study of levelling staves	Fold and unfold operations, Observe reading to the accuracy of 5 mm, Hold Levelling staff to the plumb while taking observation	
3	Temporary adjustments of dumpy level	Spread the tripod on ground properly for easy levelling and stability. Operate foot screws, Adjust eyepiece Focus the object glass	
4	Recording observations on level field book	Enter Back Sight, Fore Sight and Intermediate Sight in appropriate positions Apply the methods of calculating reducing levels by Height of instrument method and Rise and fall method Find RL when staff is inverted Apply arithmetic check	
5	Differential Levelling & Fly Levelling	Take observations Locate proper position of change point to avoid cumulative errors	Locate proper position of change point to avoid cumulative errors
6	Reciprocal Levelling	Take observations	
7	Profile leveling	Spreading chain along the required route Take readings at intervals along the route and cross sections	Take readings at intervals along the route and cross sections
8	Block Levelling	Divide area into small square blocks using chains Take readings at corners of each square	
9	Locate the contour Points by direct method in the field	Position the staff along the radial line to get the pre-calculated staff reading for a particular RL of a contour Measure the distances of the located points Measure the bearings of all radial lines	Position the staff along the radial line to get the pre-calculated staff reading for a particular RL of a contour
10	Study of transit Theodolite	Hold the instrument and fixing on tripod Identify parts and their functions Conduct operations like swinging and transiting	Center the instrument exactly over station using plum bob and by moving legs Operate foot screws to level Adjust eyepiece Focus the object glass
11	Temporary adjustments	Spread the tripod on ground properly for easy levelling and stability	

		Center the instrument exactly over station using plum bob and by moving legs Operate foot screws to level Adjust eyepiece Focus the object glass	
12	Measurement of horizontal angle by Repetition method Reiteration method and Measurement of bearing	Operate lower and upper clamps and their tangent screws read the vernier accurately Record the observations at their appropriate positions on page of theodolite field book	Operate lower and upper clamps and their tangent screws read the vernier accurately
13	Measurement of Vertical angles	Operate vertical circle clamp and its tangent screw Record the observations at their appropriate positions on page of theodolite field book	Operate vertical circle clamp and its tangent screw
15	Measurement of horizontal distance between two inaccessible points	Measure horizontal angles and horizontal distances	Measure horizontal angles and horizontal distances
16	Closed traverse	Measure of bearing of one line Measure of horizontal angles and horizontal distances	Measure of bearing of one line Measure of horizontal angles

COURSE CONTENT

1. **Levelling**
   a) Study of dumpy level, levelling staves – performing Temporary adjustments of level.
   b) Taking staff readings of various stations – booking of readings in level field book.
   c) Differential and Fly levelling – calculation of reducing levels by height of collimation and Rise & Fall methods (inverted levels also)
   d) Reciprocal levelling – True difference in elevation and collimation error.
   e) Contouring – block levelling and locating contour points by Radial method

2.0 Theodolite surveying

a) Study of transit Theodolite- Temporary adjustments of a transit theodolite.
b) Measurement of horizontal angles by repetition and reiteration methods - Recording the observations in field book
c) Measurement of vertical angles – Recording the observations in field book
d) Prolong a given survey line by double transiting method
e) Determination of horizontal distance between two inaccessible points.
f) Theodolite Traversing by included angles method

3.0 Plotting

a) Plotting the LS and CS of a route from the data of profile levelling, marking the formation level by selecting suitable gradient, calculate the depth of cutting and filling
b) Preparation of contour maps from block levelling
c) Measurement of horizontal distance between two inaccessible points by plotting the data observed in theodolite survey
d) Plot the closed traverse of theodolite, distributing the closing error by Bowditch / transit rule and calculate the area of traverse

MATERIAL TESTING PRACTICE

Subject Title	**:**	**MATERIAL TESTING PRACTICE**
Subject Code	**:**	**CE-309**
Periods/Week	**:**	**03**
Periods/Semester	**:**	**45**

TIME SCHEDULE

S.No.	Topics	No. of periods
1	Tests on bricks	05
2	Tests on Cement	10
3	Tests on Aggregates	15
4	Tests on metals	15
Total		45

OBJECTIVES

Upon completion of this course the student shall be able to

1.0 Understand the standard tests on bricks to find their suitability in construction
Water absorption test on bricks

1.1 State the significance of water absorption test on bricks
1.2 State the standards on water absorption of bricks used for various construction works
1.3 Explain the procedure for conducting water absorption test on bricks
1.4 Perform water absorption test on bricks

Crushing Strength test on bricks

1.5 State the significance of crushing strength test on bricks
1.6 State the standards on crushing strength of bricks used for various construction works
1.7 Explain the procedure for conducting crushing strength test on bricks
1.8 Perform crushing strength test on bricks
1.9 Compare observations of crushing tests conducted on different types of bricks like clay bricks, fly ash bricks, concrete blocks

2.0 Determine suitability of cement for given conditions of workability and strength
Fineness Test on cement

2.1 State the significance of workability and Compression tests in field.
2.2 State the method of preparing sample and the number of samples required for given work.

2.3 Use apparatus required for conducting fineness test on cement

2.4 State the standards on fineness of cement

2.5 Explain the procedure for conducting the fineness test on cement

2.6 Conduct the fineness test on cement and record the observations

Normal Consistency Test on Cement

2.7 State the significance of normal consistency of cement

2.8 Use apparatus required for conducting normal consistency test on cement sample

2.9 Explain the procedure for conducting normal consistency test on cement sample

2.10 Perform the normal consistency test on cement sample

2.11 Draw the inference from the observations of normal consistency of fresh cement and old cement samples of same and different grades

Setting Time Test on cement

2.12 State the significance of setting times on construction activity

2.13 State the standards on initial and final settings times of various types of cements

2.14 Use apparatus required for conducting initial and final setting times of given cement sample

2.15 Explain the procedure for conducting initial and final setting times of given cement sample

2.16 Perform the initial time test on cement sample

2.17 Draw the inference from the observations of initial setting times of fresh and old cement samples of same and different grades

Compressive Strength of cement

2.19 State the significance of compressive strength of cement used for various civil engineering works

2.20 State various grades of cement available in the market based on compressive strength of the cement

2.21 State the standards on compressive strengths of different types of cements used in construction

2.22 Use apparatus required for conducting compressive strength test on given cement sample

2.23 Explain the procedure for conducting compressive strength test on given cement sample

2.24 Perform the compressive strength test on given cement sample

2.25 Draw the inference by comparing the observations of compressive strength test on fresh and old cement samples

3.0 Determine suitability of different aggregate used for various civil engineering works

Water absorption test on sand

3.1 Study the significance of water absorption of sand used for construction

3.2 State standards on water absorption of sand

3.3 Use apparatus required for conducting water absorption test on given sand sample

3.4 Explain the procedure for conducting water absorption test on given sand sample

3.5 Perform water absorption test on given sand sample

Test on Bulking of sand

3.6 Study the effect of bulking of sand on quantities of material and quality mortar and concrete

3.7 Study the significance of bulking of sand on strength and durability properties of mortar and concrete

3.8 Use apparatus required for conducting bulking of sand test on given sand sample

3.9 Explain the procedure for conducting bulking of sand test on given sand sample

3.10 Draw the inferences from the observations of bulking of sand tests conducted fine, medium and coarse sands

3.11 Study the field method of adjustment for bulking of fine aggregate

Test on determination of bulk density and percentage of voids in Coarse and Fine aggregate

3.12 Use apparatus required for conducting test to determine bulk density of coarse and fine aggregate

3.13 Perform tests to determine bulk density of coarse and fine aggregate

3.14 Study the effect of voids in coarse and fine aggregates on strength and durability properties of mortar and concrete

3.15 Use apparatus required for conducting tests to find percentage of voids present in aggregate

3.16 Perform tests to determine percentage of voids present in aggregate

Sieve analysis of coarse and fine aggregates

3.17 Study the significance sieve analysis of fine and coarse aggregates on properties of concrete

3.18 Study of grading limits of fine aggregate as per IS: 383-1970

3.19 Use apparatus required for conducting sieve analysis of fine aggregate

Field method to determine fine silt in aggregate

3.20 Study of effect of silt in aggregate on properties of cement mortar and concrete

3.21 Use apparatus required for determining the silt content in aggregate

3.22 Explain the field method to determine quantity of silt content in aggregate

3.23 Perform the test to determine the content of fine silt in aggregate

4.0 Understand the standard tests on metals

Tension test on mild steel rod

4.1 Study the properties of mild steel used as reinforcement in concrete

4.2 State the standards on reinforcement steel as per IS Code

4.3 State various tests conducted on mild steel by using UTM

4.4 Explain the tension test on Mild steel specimen

4.5 Perform tension test on mild steel using UTM

4.6 Study the behaviour of the steel with increasing load

4.7 Draw inferences from tests on different grades of steel

Torsion test on mild steel rod

4.7 Study the significance of torsion test on mild steel

4.8 Explain the torsion test on mild steel specimen

4.9 Perform torsion test on mild steel

Hardness test on metals

4.10 Study the significance of hardness of metals

4.11 Explain the hardness test by Brinell/Rockwel testing machine

4.12 Perform hardness test on given steel and brass samples

4.13 Study hardness of different metals with variation surface smoothness of metals

Izod/Charpy Impact test on metals

4.14 Study of effect of impact loading over structures made of different metals

4.15 Explain method of Izod/Charpy impact test on Mild steel and brass specimen

4.16 Perform Impact test on Mild steel and brass specimens by sing Izod/Charpy Testing machine

Deflection test on beam

4.17 Use apparatus required for conducting deflection tests on steel and wooden beams

4.18 Perform deflection test on steel and wooden beams at different positions of loading

Deflection test on helical springs

4.19 State different types of springs used for different engineering purposes

4.20 State apparatus used for conducting deflection test on closely coiled helical spring

4.21 Perform deflection test on closely coiled helical spring

KEY Competencies to be achieved by the student

S.No	Experiment Title	Competency	Key Competency
1	Water Absorption on bricks	Taking weight of dry bricks and wet bricks	
2	Crushing strength test on bricks	1. Preparation of 1:1 cement mortar and application cement mortar over top and bottom faces of brick 2. Application of load gradually at the rate 14 N/mm^2 per minute till failure a occurs 3. Recording the load at FAILURE	Preparation of 1:1 cement mortar Application of load gradually at the rate 14 N/mm^2 per minute till failure a occurs
3	Fineness test on cement	Taking weight of cement sample and its residue	
4	Normal consistency test on cement	1. Measurement of required percentage of water to cement accurately 2. Preparation of sample in the mould 3. Reading of Vicat's scale/noting down the plunger penetration	Preparation of sample in the mould Reading of Vicat's scale/noting down the plunger penetration
5	Setting times of cement	1. Measurement of required percentage of water to cement accurately 2. Preparation of sample in the mould 3. Reading of Vicat's scale/noting down the needle penetration 4. Recording time at required needle penetration	Preparation of sample in the mould Reading of Vicat's scale/noting down the needle penetration
6	Compressive strength test on cement	1. Taking weights of different grades of standard sand and cement accurately 2. Addition of required percentage of water to cement accurately 3. Application of load at required rate and recording of load at failure accurately	Application of load at required rate and recording of load at failure accurately
7	Water absorption of sand	Accurate weighing of dry sand and wet sand	
8	Bulking of sand	1. Measuring of sand and water accurately	Measuring of increasing in volume of sand

		2. Addition of water to sand in accurate increments 3. Measuring of increasing in volume of sand	
9	Determination of necessary adjustment for bulking of fine aggregate by field method	Measurement of volume of sand accurately	--
10	Bulk density and Percentage of voids in coarse and fine aggregates	1. Taking of weight of cylindrical metal measure accurately 2. Calculating of bulk density of coarse and fine aggregates both in loose and compacted states 3. Taking weight of aggregate and containers	Taking weight of aggregate and containers
11	Sieve analysis of coarse and fine aggregate	1. Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate 2. Weighing of residue in each sieve accurately	Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate
12	Field method of determining fine silt in aggregate	1. Measuring sand by graduated cylinder accurately 2. Measuring correct quantity of water to be added to sand	--
13	Tension test on mild steel rod	1. Marking of gauge length on the MS Rod 2. Fixing the specimen correctly in between jaws 3. Application of load at required rate carefully 4. Measuring the load at failure accurately	Fixing the specimen correctly in between jaws Application of load at required rate carefully
14	Torsion test on mild steel rod	1. Measurement of length and diameter of specimen accurately 2. Application of load accurately 3. Measuring the angle of rotation accurately	Application of load accurately Measuring the angle of rotation accurately
15	Brinell/Rockwell	1. Placing of specimen at exact position 2. Application and release of load at required rate	--
16	Izod/Charpy test on mild steel/brass	1. Preparation of standard specimen and fixing the specimen in the right position of anvil	Preparation of standard specimen and fixing the specimen in the right position of anvil

		2. Recording down the reading by observing the appropriate scale	
17	Deflection test on beams	1. Measuring the dimensions of specimen accurately	Measurement of deflection accurately
		2. Application of load at exact point of application	
		3. Measurement of deflection accurately	
18	Test on helical coiled springs	1. Measurement of diameter of coil wire, diameter of coil and no. of coils accurately	Measurement of deflection of springs
		2. Measurement of deflection of springs	

COURSE CONTENT

1. Tests on Bricks

a) Water absorption

b) Crushing strength

2. Tests on Cement

a) Fineness test
b) Normal consistency test
c) Setting times of cement
d) Compressive strength of cement.

3. Tests on Aggregates

(a) Water absorption of Sand
(b) Bulking of Sand
(c) To determine necessary adjustment for bulking of fine aggregate by Field method
(d)Bulk density and Percentage of voids in Coarse and fine aggregates
(e) Sieve analysis of coarse and fine aggregates
(f) Field method to determine fine silt in aggregate

4. Tests on Metals

(a) Tension test on mild steel rod
(b) Torsion test on mild steel rod
(c) Brinell/Rockwel - hardness test on steel and Brass with different surface finish
(d) Brinell/Rockwel - hardness test on steel and Brass with different surface finish
(e) Izod/Charpy tests on mild steel/brass.
(f) Deflection Test on beam (Steel beam or wooden beam)
(g) Test on closely coiled helical spring

HYDRAULICS PRACTICE

Subject Title : HYDRAULICS PRACTICE
Subject Code : CE-310
Periods/Week : 03
Periods/Semester : 45

TIME SCHEDULE

S. No	Major Topics	No. of Periods
1.	Determination of Hydraulic Coefficients / factors / Constant / Verification of Principles / Laws	36
2.	Study on Hydraulic Machines	09
	Total	45

OBJECTIVES

Upon completion of the course the learner shall be able to

1.1 Determine coefficient of discharge of a small orifice by constant head method and variable head method.

1.1.1 State the principle / law / apparatus / equipment required for testing.
1.1.2 Perform test and record observations.
1.1.3 Draw inferences on the relationship between parameters.
1.1.4 Draw a graph between Q vs $H^{1/2}$.

1.2 Determine coefficient of discharge of a small orifice by variable head method.

1.2.1 State the principle / law / apparatus / equipment required for testing.
1.2.2 Perform test and record observations.
1.2.3 Draw inferences on the relationship between parameters.
1.2.4 Draw a graph between Q vs $H^{1/2}$.

1.3 Determine the hydraulic coefficients of an orifice.

1.3.1 State the Relationship.
1.3.2 Conduct test and record observations.
1.3.3 Draw Conclusions.

1.4 Determine coefficient of discharge of a mouthpiece by constant head method.

1.4.1 State the principle/law /apparatus/equipment required for testing.
1.4.2 Perform test and record observations.
1.4.3 Draw inferences on the relationship between parameters.
1.4.4 Draw a graph between Q vs $H^{1/2}$.

1.5 Determine coefficient of discharge of a rectangular notch.

1.5.1 State the Aim /apparatus/equipment required for testing.
1.5.2 Perform test and record observations.
1.5.3 State field application.
1.5.4 Draw a graph between Q vs $H^{3/2}$.

1.6 Determine coefficient of discharge of a triangular notch.

1.6.1 State the Aim /apparatus/equipment required for testing.
1.6.2 Perform test and record observations.
1.6.3 State Field application.
1.6.4 Draw a graph between Q vs $H^{5/2}$.
1.6.5 Compare results with rectangular notch.

1.7 Determine coefficient of discharge of a trapezoidal notch.

1.7.1 State the Aim /apparatus/equipment required for testing.
1.7.2 Perform test and record observations.
1.7.3 State field application.
1.7.4 Draw inferences comparing the result s with rectangular notch and triangular notch.

1.8 Verify Bernoulli's theorem.

1.8.1 States the principle/law /apparatus/equipment required .
1.8.2 Perform test and record observations.
1.8.3 State Inference and application.
1.8.4 Plot Hydraulic gradient line and Total energy line.

1.9 Determine coefficient of discharge of a venturimeter.

1.9.1 State the Aim /apparatus/equipment required .
1.9.2 Perform test and record observations.
1.9.3 State Practical application.
1.9.4 Draw a graph between Q vs $H^{1/2}$.

1.10 Determine friction factor in pipe flow.

1.10.1 State the Aim /apparatus/equipment required .
1.10.2 Perform test and record observations.
1.10.3 State Importance of friction factor in pipe design.

1.11 Determine Chezy's constant in open channel flow.

1.11.1 State the Aim / apparatus / equipment required .
1.11.2 Perform test and record observations.
1.11.3 State Importance in design of section of open channel.

2.0 Study on Hydraulic machines.

2.1 Study on Reciprocating pump.

2.1.1 Identify the component parts of a reciprocating pump.
2.1.2 State the functions of each component.
2.1.3 State field applications.

Study on Centrifugal pump

2.2.1 Identify the component parts of a reciprocating pump
2.2.2 State the functions of each component
2.2.3 State field applications and compare with Reciprocating pump.

2.3 Study on Hydraulic Turbines

2.3.1 Identify the component parts of Pelton wheel, Francis or Kaplan turbines.
2.3.2 State function of each component
2.3.3 State field applications.

KEY Competencies to be achieved by the student

S. No	Experiment Title	Competency	Key Competency
1	Coefficient of discharge of small orifice by constant head.	Regulate the flow Operate stop clock accurately Draw graph between Q vs $H^{1/2}$	Regulate the flow Operate stop clock accurately Draw graph between Q vs $H^{1/2}$
2.	Coefficient of discharge of small orifice by variable head	Note readings of head at intervals. Operate stop clock accurately Draw graph between Q vs $H^{1/2}$	
3	Hydraulic coefficients of orifice.	Regulate flow. Note co-ordinate values and measure volume Operate stop clock accurately State the relation.	
4.	Coefficient of discharge of mouth piece by constant head.	Regulate the flow Operate stop clock accurately graph between Q vs H1/2	
5.	Coefficient of discharge of rectangular notch.	Note readings of head Operate stop clock accurately Draw graph between Q vs$H^{3/2}$	
6.	Coefficient of discharge of triangular notch	Note readings of head Operate stop clock accurately Draw graph between Q vs $H^{5/2}$	
7	Coefficient of discharge of trapezoidal notch	Note readings of head Operate stop clock accurately Compare the results with rectangular and triangular notch.	
8	Verify Bernoulli's theorem	Note readings of head at various locations Plot hydraulic gradient line and total energy line	

9	Coefficient of discharge of venturimeter.	Note readings of head Operate stop clock accurately Draw graph between Q vs $H^{1/2}$	Regulate the flow Operate stop clock accurately Draw graph between Q vs $H^{1/2}$
10	Friction factor in pipe flow.	Note readings of head Observe the significance of friction factor of pipe flow.	Observe the significance of friction factor of pipe flow.
11	Chezy's constant	Note readings of head Observe the significance in design of section of open channel	

COURSE CONTENT

LIST OF EXPERIMENTS

I Determination of Hydraulic Coefficients/factors/Constant/Verification of Principles/ Laws

1. Determination of coefficient of discharge of a small orifice by constant head method
2. Determination of coefficient of discharge of a small orifice by variable head Method
3. Determination of Cc of an orifice by finding C_v and C_d.
4. Determination of coefficient of discharge of a mouthpiece by constant head method.
5. Determination of coefficient of discharge of a triangular notch.
6. Determination of coefficient of discharge of a rectangular notch.
7. Determination of coefficient of discharge of a trapezoidal notch.
8. Verification of Bernoulli's theorem.
9. Determination of coefficient of a discharge of a venture meter.
10. Determination of friction factor in pipe flow.
11. Determination of Chezy's constant in open channel flow.

II Study of Fluid machines

12. Study on reciprocating pump and centrifugal pump.
13. Study on turbines – Pelton / Francis / Kaplan.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV Semester

TIME SCHEDULE

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE - 401	Mathematics - III	4	-	60	3			100
CE - 402	Theory of Structures	5	-	75	3			100
CE - 403	Quantity Surveying - I	5	-	75	3			100
CE - 404	Surveying – III	4	-	60	3			100
CE - 405	Transportation Engineering	5	-	75	3			100
PRACTICAL:								
CE - 406	CAD Practice		6	90	3			100
CE - 407	Building Services Drawing	-	3	45	3			100
CE - 408	Communication skills Lab Practice	-	3	45	3			100
CE - 409	Surveying - III Practice Communication Skills Practice	-	7	105	3			100
TOTAL		23	19	630				900

THEORY OF STRUCTURES

Subject Title : THEORY OF STRUCTURES
Subject Code : CE-402
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

Sl. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Answer Type
1	Columns and Struts	15	23	01	02
2	Dams and Retaining walls	20	32	04	02
3	Statically indeterminate beams	25	39	03	03
4	Stresses in Frames	15	16	02	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0. Understand the behaviour of columns under vertical loads

1.1 Define : i) Compression member ii) Axial Loading
1.2 List different types of compression members
1.3 Define : i) Buckling / Critical / Crippling Load ii) Actual length iii) Least radius of gyration iv) Safe load v) Factor of safety
1.4 Calculate least radius of gyration for solid / hollow circular, square and rectangular sections
1.5 List different end conditions used for a column
1.6 Define i) Effective / equivalent length ii) Slenderness ratio
1.7 List the effective lengths of columns for different end conditions
1.8 Calculate the slenderness ratio for a given column/strut
1.9 Classify columns based on slenderness ratio or length and lateral dimensions
1.10 Distinguish between Long and short columns.
1.11 State Euler's formula for crippling load of a column / strut (derivation not required)
1.12 Derive an expression showing limitations of Euler's formula.
1.13 Solve problems on limitations of Euler's formula

1.14 Calculate crippling and safe loads on a column / strut with simple / built up section using Euler's formula
1.15 Explain the validity of Rankine's formula for short and long columns using basic Rankine's empirical formula
1.16 Obtain Rankine's formula for crippling load of a column / strut from basic empirical formula
1.17 Calculate crippling or safe loads on a column / strut with simple / built up section using Rankine's formula
1.18 Calculate the ratio of strengths of hollow and solid circular columns loaded under same conditions
1.19 Design a hollow circular cross section of a column for the given data
1.20 Obtain the expression for pressure distribution at the base of a column, subjected to eccentric load about one axis only
1.21 Compute the pressure distribution at the base of a column, subjected to an eccentric load about one axis only
1.22 Define the core of a column
1.23 Calculate core for circular / square / rectangular columns and draw the shapes of core

2.0. Understand the Stability of Retaining walls and dams under the action of lateral pressures

2.1. Define a dam/ retaining wall.
2.2. List the forces acting on a dam / retaining wall.
2.3. Derive the formula for maximum and minimum stress intensities at the base of a Trapezoidal dam with vertical water face.
2.4. Sketch the stress distribution at the base of a dam / retaining wall for different conditions
2.5. Calculate the stress intensity at base of a rectangular / Trapezoidal dam with or without free board
2.6. List the conditions for stability of a dam / retaining wall
2.7. Define middle third rule
2.8. Define minimum base width of a dam / retaining wall
2.9. Derive the formula for minimum base width of a dam without free board to avoid tension at the base for the following sections
1. Trapezoidal section 2. Rectangular section 3.Triangular section
2.10. Calculate the minimum base width based on above formulae
2.11. Calculate the minimum base width of a trapezoidal dam with vertical water face and having free board to avoid tension and sliding.
2.12. Explain the procedure to find the stresses at the base of a dam with battered water face
2.13. Calculate the stresses at the base of a dam with inclined water face
2.14. Solve the problems on checking the stability of a dam with vertical / inclined water face
2.15. Define: i) Angle of repose of soil ii) Angle of Surcharge iii) Active earth pressure iv) Passive earth pressure
2.16. Differentiate between active earth pressure and passive earth pressure
2.17. Compute the lateral earth pressure on a retaining wall having soil face vertical with levelled earth, surcharged earth and with levelled earth and UDL
2.18. Calculate the stresses at the base of a retaining wall for the above cases

2.19. Calculate the minimum base width of a retaining wall with vertical soil face and levelled earth to avoid tension and sliding at base
2.20. Calculate the stresses at the base of a retaining wall with levelled earth and soil face inclined
2.21. Check the stability of a retaining wall with soil face vertical and having leveled / surcharged earth OR with soil face inclined and having levelled earth
2.22. State Rankine's formula for minimum depth of foundation
2.23. Calculate minimum depth of foundation for walls and columns using Rankine's formula

3.0. Understand the effects of Loading on propped cantilevers, fixed and continuous beams

3.1. Differentiate between a statically determinate and indeterminate structure.
3.2. Define degree of static indeterminacy
3.3. Calculate degree of static indeterminacy for
1. Propped cantilever,
2. Fixed beam and
3. Two span continuous beam
3.4. Calculate prop reaction of propped cantilever subjected to UDL throughout OR a single point load between fixed and propped ends
3.5. Calculate SF and BM values and draw SFD and BMD for a propped cantilever with above type of loading only.
3.6. Calculate the location of point of contra flexure in propped cantilever for above loading.
3.7. State the merits and demerits of fixed beams.
3.8. Derive the conditions required for the analysis of fixed beams by moment area method.
3.9. Derive the formulae for the fixed end moments due to central point load or UDL throughout on a fixed beam.
3.10. Draw SFD and BMD for a fixed beam with above type of loading only.
3.11. State the formulae for maximum deflection in a fixed beam due to above loading.
3.12. Calculate the maximum deflection in a fixed beam using above formulae.
3.13. State the merits and demerits of continuous beams.
3.14. State the equation based on theorem of three moments.
3.15. Calculate support moments and span moments for a two span continuous beam with simply supported or over hanging ends only, subjected to central point load or UDL throughout on each span, using theorem of three moments.
3.16. Calculate the support reactions for above type of continuous beams.
3.17. Draw SFD and BMD for two span continuous beams, using theorem of three moments.
3.18. Define stiffness factor, distribution factor and carry over factor.
3.19. Calculate stiffness factor and distribution factor at an intermediate support of a beam or non-hinged joint.
3.20. Calculate span moments and support moments for two span or three span continuous beams with different end conditions, carrying central point load or UDL throughout on each span, using moment distribution method
3.21. Draw BMD only for the two span or three span continuous beams with the above type of loading and end conditions, using moment distribution method.

4.0. Understand the effect of Dead and Live loads on statically determinate frames

4.1. Define a frame.

4.2. Classify the fames based on 1. Number of members and 2. Number of joints.

4.3. Show the sign convention for different types of stresses in members of a truss / frame

4.4. Explain the rules for assuming the direction of stresses in the members.

4.5. Explain the method of calculating stresses / forces in the members of a truss / frame by the method of joints.

4.6. Calculate the stresses / forces in the members of a simply supported or cantilever truss / frame subjected to DL & LL at nodal points by the method of joints and prepare force table.

4.7. Explain the method of calculating stresses / forces in the members of a truss / frame by the method of sections.

4.8. Differentiate method of joints and method of sections.

4.9. Calculate the stresses in the members of a simply supported or cantilever truss / frame subjected to DL & LL at nodal points by the method of sections and prepare force table.

COURSE CONTENT

1.0 Columns and struts

a) Short and long columns – Axial loading only – solid circular, Hollow circular, Rectangle and I section and Built up columns – different end conditions – slenderness ratio – calculation of safe load on columns by Euler's and Rankine's formula – Effective length, radius of gyration and slenderness ratio - limitation of Euler's formula – strength of columns – problems – stress distribution at the base of column due to eccentric load about one axis-problems – core of a column

2.0 Dams and retaining walls

a) Introduction – rectangular dams – trapezoidal dams having water face vertical and inclined – Conditions for the stability of a dam – conditions to avoid tension in the masonry dam at its base, to prevent the over – turning of the dam, the sliding of dam and to prevent the crushing of masonry at the base of the dam – Minimum base width of a dam.

b) Active and passive earth pressure – Angle of internal friction – Angle of surcharge – calculation of active earth pressure by Rankine's formula with and without surcharge.

c) General conditions of stability of retaining walls – middle third rule – Distribution of pressure on foundation of retaining walls – calculation of minimum base width.

d) Calculation of minimum depth of foundation by Rankine's formula.

3.0 Statically indeterminate beams

a) Statically determinate and indeterminate structures – definition – degree of static indeterminacy

b) Cantilever beam with UDL on whole span and propped at free end – cantilever beams with point load between fixed and propped ends – Calculation of prop reaction – SFD and BMD.

c) Fixed Beams: Introduction-Sagging and hogging Bending moments – merits and demerits – Determination of Fixed end moments by moment Area method – standard cases – fixed beams subjected to symmetrical concentrated loads – Fixed beams subjected to U.D.L throughout – sketching B.M.D. and S.F.D – problems (without sinking of props) – Max deflection formulae of fixed beams subjected to central point load and U.D.L throughout (No derivation) – problems.

d) Continuous Beams: Merits and demerits – Continuous beams – effect of continuous supports – support moments – Clapeyron's Theorem of three moments – equation (without derivation) – continuous beams with central point load or U.D.L. throughout for each span – problems on two span continuous beams with simply supported or over hanging ends only – Reaction at supports in continuous beams – sketching S.F.D. and B.M.D (Beam with varying moments of inertia, supports at different levels not included)

e) Moment distribution Method (Hardy cross method) – Introduction - Sign conventions – stiffness factor – carry over factor – Distribution factor – Application to continuous beams of Two span and three span with central point load or UDL throughout on each span (for any type of end support) - sketching B.M.D. only (beam with varying moments of inertia, supports at different levels not included)

4.0 Stresses in frames

Frames – Definition – classification based on number of members and number of joints – Determination of forces in members of statically determinate pin jointed frames – method of sections and method of joints – Application to simple frames and trusses (simply supported and cantilever) under loads at joints.

REFERENCE BOOKS

1. Strength of Materials by S.Ramamurtham
2. S.M and T.S – by B.C. Punmia
3. Strength of Materials – by R.S. Khurmi
4. Graphical Methods in structural analysis by D S Prakash Rao
5. Structural Analysis – A Unified Approach by D S Prakash Rao
6. Mechanics of solids by – R.K .Rajput
7. Strength of Materials – by R.K. Bansal
8. Strength of Materials – R.Subramanian Oxford University Press

QUANTITY SURVEYING - I

Subject Title : Quantity Surveying - I
Subject Code : CE- 403
Periods / week : 05
Periods / Semester : 75

Time Schedule

Sl. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Introduction, Units and Specifications	08	16	02	01
2	Earth work calculations	20	29	03	02
3	Types of estimates of buildings	15	26	02	02
4	Preparation of detailed estimates	32	39	03	03
Total		75	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand basic concepts of Quantity Surveying, Units and Specifications

1.1 Define:
   a) Quantity Surveying
   b) Estimate
1.2 State the need for quantity surveying
1.3 State different types of estimates
1.4 Explain the need for different estimates
1.5 Distinguish among element of structure, item of a work & materials of construction
1.6 List the duties of Quantity Surveyor
1.7 State the units of measurements, data and payment for different items of work and materials using I S : 1200
1.8 State two types of taking out measurement.
1.9 Explain Centre Line Method – Long and Short Wall Method
1.10 Explain the process of taking measurements for different works and tolerances
1.11 Define specifications
1.12 State the need for specifications

1.13 State different types of specifications
1.14 Give the general specifications for important items of work

2.0 Compute the volumes of earth work and reservoir capacity

2.1 Explain terms:
- a) Embankment
- b) Cutting
- c) Volume of earth work

2.2 Define:
- a) Lead
- b) Lift

2.3 State the standard values of 1.Lead and 2. Lift
2.4 Calculate the lead and lift for a given section
2.5 List different methods of computing the areas and volumes
2.6 Explain:
- a) Mean sectional area method
- b) Mid sectional area method
- c) Trapezoidal rule
- d) Prismoidal rule

2.7 State the limitations of prismoidal rule
2.8 Determine the areas of an embankment for a given data
2.9 Determine the areas of a cutting for a given data
2.10 Prepare detailed estimates for earth work for roads, canals and earthen bunds
1.11 Compute gross and effective capacity of a reservoir from the areas of different elevations

3.0 Understand different types of estimates

3.1 State different types of estimates
3.2 Explain:
- a) Approximate or preliminary estimate
- b) Detailed estimate
- c) Abstract estimate

3.3 State the methods of preparing approximate estimates
3.4 Explain:
- a) Plinth area method
- b) Cubic content method
- c) Service unit method

3.5 Prepare approximate estimates for residential and non-residential buildings with given data of size / capacity and rates considering cost of building services and other over heads
3.6 Differentiate between detailed estimate and abstract estimate
3.7 Write formats of detailed estimate and abstract estimate

4.0 Prepare detailed estimates for various Civil Engineering Structures

4.1 State the information required for preparation of detailed estimates of a building
4.2 State different methods of taking out quantities
4.3 Explain different methods of taking out quantities
4.4 Prepare the detailed estimates for various buildings from the given drawings, specifications and site conditions:

a) Compound wall and Steps
b) Single Room Building
c) Single Room with Verandah
d) Single storied Residential building with one bed room (1 BHK)
e) Single storied Residential building with two bed rooms (2 BHK)
f) Three Bed room building (3 BHK)
g) Two storied residential building
h) Buildings with Sloped roofs like pitched roof, lean to roof, hipped & valley roof
i) Primary school building

4.5 Prepare the estimation of a steel roof truss for an Industrial building

COURSE CONTENT

1. Introduction of Unit measurements and Specifications

a) Quantity surveying – Definition of estimate – Need for estimation – Types of estimates – Approximate estimate – Detailed estimate – Abstract estimate – Duties of Quantity Surveyor – Elements of a structure – Item of Work – Materials of construction – Line diagram for preparation of abstract estimate

b) Units of measurements for various items of civil engineering works as per IS :1200

c) Degree of accuracy in measurement – Deductions for openings in masonry, RCC and Plastering – Painting coefficients

d) Different Methods of taking out quantities – Centre Line Method – Long and Short Wall Method

d) Specifications – Necessity – Types of specifications – General specifications of:

i) Earth works
ii) Brick / Stone Masonry with C.M
iii) Reinforced Cement Concrete
iv) Plastering with C.M
v) Floor finishes with ceramic tiles and marbles
vi) White washing / Colour washing

2. Earth Work Calculations

a) Lead and Lift – Initial and subsequent values
b) Mid- Ordinate Method – Mean Sectional Area Method – Trapezoidal Rule – Prismoidal Rule for computing volumes in level sections for roads and Canals
c) Taking out quantities from Longitudinal Section and Cross Section in cutting and embankment of level sections
d) Capacity of Reservoir from the table of areas and contours

3. Types of Estimates of Buildings

a) Types of estimates – Preliminary or Approximate Estimate – Detailed Estimate – Abstract Estimate – Definitions – Formats for detailed and abstract estimates.
b) Preliminary or Approximate Estimate – Plinth area method – Cubic rate method – Service Unit method
c) Problems in Preliminary estimate

4. Preparation of detailed estimates for various Civil Engineering structures with loading bearing walls

a) Compound wall and steps
b) Single Room Building
c) Single Room with Verandah
d) Single storied Residential building with one bed room (1 BHK)
e) Single storied Residential building with two bed rooms (2 BHK)
f) Three Bed room building (3 BHK)
g) Two storied residential building
h) Buildings with Sloped roofs like pitched roof, lean to roof, hipped & valley roof
i) Estimation of a steel roof truss
j) Primary school building

REFERENCE BOOKS

1. Estimating and Costing - B.N. Dutta
2. Estimating and Costing - S. C. Rangawala
3. Estimating Construction Costs - Robert L. Peurifoy & Garold D. Oberlender

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SURVEYING – III

Subject Title : Surveying – III
Subject Code : CE - 404
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

Sl. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1	Trigonometric levelling	10	23	01	02
2	Tacheometry	15	26	02	02
3	Curves	15	26	02	02
4	Electronic Surveying Instruments	10	19	03	01
5	Total Station	10	16	02	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of this course the student shall be able to

1.0 Understand the principles of Trigonometrical Levelling

1.1. Define of trigonometrical levelling
1.2. Enumerate the different cases that occur in trigonometrical levelling to find the elevation and distance of a given object (base of the object accessible or inaccessible)
1.3. Derive formula for finding height and elevation of an object when the base of the object is accessible.
1.4. Calculate the height and elevation of an object when the base of the object is accessible.
1.5. Derive the formula to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane
1.6. Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane

1.7. Describe the procedure to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane.

1.8. Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane.

2.0 Understand the principle of Tacheometry to find the elevations and distances of stations

2.1 Define tacheometry

2.2 List the uses of tacheometry

2.3 Explain the principles of stadia tacheometry

2.4 Explain the advantage of use of Analogue table

2.5 List the different methods of tacheometry

2.6 Define staff intercept

2.7 List the constants of tacheometry in stadia tacheometry

2.8 Derive the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical

2.9 Derive the formulae to determine the elevation of the staff station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical

2.10 Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is horizontal with staff held vertical.

2.11 Explain the procedure for determining tacheometric constants

2.12 State the use of analytic lense

2.13 Write the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation)

2.14 Write the formulae to determine the elevation of the staff station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation)

2.15 Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is inclined with staff held vertical.

2.16 Compute the horizontal distance and difference in elevations between any two staff stations (instrument station and staff stations are lying in the same vertical plane) using stadia tacheometry

2.17 Compute the horizontal distance and difference in elevations between any two staff stations (instrument station and staff stations are not lying in the same vertical plane) using stadia tacheometry

2.18 Explain the principle of Tangential Tacheometry

2.19 Enumerate the difference between Stadia and tangetial tacheometries

2.20 Derive the formula to determine the distance of staff station from the instrument station and elevation of the staff station by tangential tacheometry

2.21 Compute the horizontal distance of staff station from instrument station and its elevation by tangential tacheometry

2.22 Compute the horizontal distance and difference in elevations between any two staff stations using tangential tacheometry (instrument station and staff stations are lying in the same vertical plane)

2.23 Compute the horizontal distance and difference in elevations between any two staff stations using tangential tacheometry (instrument station and staff stations are not lying in the same vertical plane)

3.0 Understand the method of setting out simple curves

3.1 List the types of horizontal curves

3.2 Define Simple curve

3.3 Define degree of curve and state the relation between the radius and degree of curve according to chord length / arc length

3.4 Calculate degree of curve using above relations

3.5 Sketch a simple circular curve and show its elements

3.6 Define various elements of a simple circular curve

3.7 Compute the length of curve, tangent length, length of long chord and mid ordinate, apex distance and chainages at salient points of a curve

3.8 List the linear and angular methods of curve setting

3.9 Explain the procedure for setting out a curve by linear methods

3.10 Explain the procedure for setting out a curve by angular methods

3.11 Calculate the data required for setting out a curve for above methods and Prepare the curve tables

4.0 **Understand the principles and uses of Electronic Surveying instruments**

4.1 List the modern surveying instruments

4.2 Explain the principle of EDM

4.3 Explain the features of electronic theodolite and distomat

4.4 State the uses of electronic theodolite and distomat

4.5 Define GPS

4.6 Explain the working principle of GPS

4.7 Explain the segments of GPS

4.8 Enumerate the types of GPS receivers

4.9 Explain taking coordinates of various points using GPS

4.10 List the applications of GPS in civil Engineering

4.11 List merits and demerits of GPS

4.12 Define GIS

4.13 State the components of GIS

4.14 List the types of data used in GIS

4.15 Explain the data used in GIS

4.16 Define map

4.17 List the types of map projections

4.18 List the uses and applications of GIS in civil Engineering

4.19 State the principle of Photogrammetry
4.20 Explain the types of terrestrial photogrammetry
4.21 Explain the use of stereoscope in photogrammetry

5.0 Understand the principles of total station

5.1 List the parts of total station and their functions
5.2 Explain the setting up total station for taking observations
5.3 List the uses of total station
5.4 Explain the procedure for measurement of distances and angles
5.5 Explain procedure of taking multiple number of observations on a single station
5.6 Explain the procedure for measurement of area with single station setup
5.7 Explain the procedure of traversing using total station
5.8 Explain the orientation of total station by resection method
5.9 Explain establishing TBM by station elevation method
5.10 Explain Staking out a point, line and an arc
5.11 List the steps involved in marking the centre line for a typical residential building
5.12 Explain the procedure for LS and CS for proposed road / canal/ pipe line

COURSE CONTENTS

1.0 Trigonometric levelling

a) Principle and necessity of Trigonometric levelling
b) Elevations and distances of objects whose base is accessible or inaccessible, with instruments stations and object in the same vertical plane or in different vertical planes.

2.0 Tacheometry

a) Tacheometry – principle – uses – types – stadia and tangential tacheometries
b) Stadia Tacheometry with staff held vertical and line of collimation horizontal or inclined – elevations and distances of staff stations – determination of Tacheometric constants - Tachometric tables - problems
c) Tangential Tachometry – uses – Finding elevation and distances – Problems.

3.0 Curves

a) Curves – types of horizontal curves – simple, compound and reverse curves – degree of curve – formulae for degree of curve using 20m / 30m chain – elements of simple circular curve – Point of commencement of curve, point of tangency, forward and back tangents, point of intersection, angle of intersection, deflection angle, length of curve, tangent length, long chord, mid ordinate, normal chord and sub chord
b) Calculation of elements of simple circular curve

c) Method of curve setting – chain and tape methods – offsets from long chord method, successive bisection of arcs method, off sets from tangent (radial and Perpendicular offsets) method and off sets from chords produced method – angular methods – single and double theodolite methods
d) Preparation of curve table for curve setting – problems.

4.0 Electronic Survey instruments and GPS and GIS

a) Principle and uses of EDM – Electronic theodolite and distomat – uses
b) Global positioning system (G.P.S) – principle – segments – space, control and user segments – receivers – observation and data processing - applications in Civil Engineering – advantages and disadvantages of GPS
c) Geographical Information System (GIS) – definition – Map – Map projections – types data used – use and application of GIS in Civil Engineering.
d) Introduction to Photogrammetry – types of Photogrammetry – basic principles – terrestrial photogrammetry – stereo and plane table photogrammetries – stereoscope

5.0 TOTAL STATION

a) Parts and functions – setting up total station for taking observations - Use of Total Station - Measurement of distances and angles - multiple number of observations on a single station - measurement of area with single station setup - orientation of total station by resection method - establishing TBM by station elevation method - marking the centre line for a typical residential building - LS and CS for proposed road / canal / pipe line

REFERENCE BOOKS

1	Surveying I & II	by B.C.Punmia
2	Surveying	by S.K. Husain
3	Surveying and levelling I & II	by -T .P Kanetkar
4	Surveying - I & II	by A. V.R.J. Sharma and Kamala
5	Text book of surveying	by Dr.C.Venkata Ramaiah

TRANSPORTATION ENGINEERING

Subject Title : Transportation Engineering
Subject Code : CE-405
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S.No	Major Topics	No of periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to Highways and Soil Mechanics	21	16	02	01
2	Highway Surveys and Traffic Engineering	10	23	01	02
3	Highway Constructions and Maintenances	12	23	01	02
4	Introduction and Permanent way of Railways	10	13	01	01
5	Station yards and Maintenance of Railways	07	16	02	01
6	Bridges, Culverts and Cause ways	15	19	03	01
	Total	75	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the basics of Highways and Soil Mechanics

1.1. State the importance of transportation engineering.
1.2. State the importance of I.R.C
1.3. List the functions of I.R.C
1.4. Classify roads as per I.R.C
1.5. Defines:
   1. Width of pavement,
   2. Shoulder,
   3. Formation width,
   4. Right of way,
   5. Camber,
   6. Gradient,
   7. Super elevation, and
   8. Sight distance.
1.6. Explain the components of a road with a sketch.
1.7. State the three types of gradients
   1. Ruling gradient,
   2. Limiting gradient and
   3. Exceptional gradients and their recommended values.
1.8. State recommended values of gradients by I.R.C

1.9. State the need for providing super elevation
1.10. Write the formula for super elevation
1.11. State the need for curves in highways.
1.12. State the different types of horizontal curves adopted in road
1.13. State the different types of vertical curves adopted in road
1.14. List physical properties of soils
1.15. Define the following physical properties of soils:
    1. Plasticity,
    2. Cohesion,
    3. Consolidation,
    4. Compaction,
    5. Permeability and
    6. Compressibility
1.16. State the different systems of classification of soils
1.17. Explain the textural classification soils with sketches as per I S Classification of soils.
1.18. In respect of soils, define:
    1. Ultimate bearing capacity of soil,
    2. Safe bearing capacity, and
    3. Net safe bearing capacity.
1.19. State the presumptive bearing capacity values and the codes equation for the calculation of bearing capacity as per IS code.

2.0 Understand Highway Survey and Traffic Engineering

2.1 Define alignment of road.
2.2 State the factors influencing selection of alignment for a road in plain and hilly areas.
2.3 List the surveys required for fixing alignment.
2.4 State the different data required for the preparation of highway project.
2.5 Explain various engineering surveys conducted to fix the alignment of a road.
2.6 State the importance of traffic census/traffic surveys.
2.7 List various traffic surveys conducted.
2.8 Explain the following with neat sketches:
    1. Traffic islands and
    2. Interchanges.
2.9 State types of pavement markings with sketches.
2.10 State the functions of pavement markings with sketches
2.11 State the purpose of traffic signs
2.12 State the functions of traffic signs with sketches.

3.0 Understand Highway construction and Maintenance

3.1 State the need for road drainage.
3.2 Explain the methods of providing surface and sub-surface drainage.
3.3 State the materials used in construction of different types of roads
3.4 List the tests on Bitumen.
3.5 State the equipment/machinery used in construction of different roads.
3.6 Explain the methods of construction of different types of roads.
3.7 Explain the maintenance of WBM of roads.
3.8 Explain the different types of joints used in C.C roads with sketches.
3.9 State the need for joints in C.C roads.

4.0 Understands Introduction and Permanent way of Railways

4.1 State the advantages of Railways.
4.2 Define gauge and
4.3 Classify gauges.
4.4 State the component parts of a permanent way
4.5 List the functions of each component parts of a permanent way
4.6 State the requirements/characteristics of
1. Good rail,
2. Rail joint,
3. Sleeper and
4. Ballast.
4.7 State the different types of
1. Rails,
2. Joints,
3. Rail fittings,
4. Sleepers,
5. Ballast,
used in Indian Railways with sketches (wherever required).

5.0 Understand Station yard and Maintenance of Railways

Describe different types of turnouts with sketches.
5.1 Describe different types of crossings with sketches
5.2 Classify stations.
5.3 State different maintenance measures of a railway track.
5.4 State the duties of a permanent way inspector.

6.0 Understands Bridges, Culverts and Cause ways

6.1 Classify bridges based on materials, position of bridge floor and form/type of super structure.
6.2 State the factors influencing selection of site for a bridge.
6.3 State the data required for preparation of bridge project.
6.4 Define:
1. Waterway,
2. Linear waterway,
3. Afflux,
4. Vertical clearance,
5. Scour depth, and
6. Free board.
6.5 State the formulae for economical span and afflux.
6.6 State component parts of a bridge sub-structure with sketches
6.7 List the functions of a bridge sub-structure
6.8 Distinguish between deck and through bridge.
6.9 Draw different types of bridge super structures.
6.10 List different types of 1. Causeways and 2. Culverts.
6.11 State suitability of different types of culverts
6.12 State suitability of different types of causeways.
6.13 Sketch different types of causeways
6.14 Sketch different types of culverts

COURSE CONTENT

1. Introduction of Highway and Soil Mechanics

a) Importance of transportation engineering – I.R.C. – Classification of roads as per I.R.C.

b) Cross section of a road structure – sub grade – sub-base, base and wearing course-Width of pavement, shoulder, formation width, right of way, road boundaries – road widths for different classification of roads, traffic lane widths-camber – recommended I.R.C values of camber for different roads.

c) Gradients – Ruling gradient, limiting and exceptional gradients – Recommended I.R.C values of gradients.

d) Super elevation – Necessity – Curves – necessity of curves in roads – transition curves – details of alignment for horizontal and vertical curves.

e) Physical properties of soil like plasticity, cohesion, consolidation, compaction, Permeability and compressibility.

f) Soil moisture content – Specific gravity and density.

g) Types of soils – residual soil – transported soil – sand – silt – clay – peat – Till – Tull – loess – Bentonite – Soils in India

h) Different systems of classification of soils – Textural classification – I S classification of soils

i) Bearing Capacity – Definition – Importance in foundation design

j) Presumptive bearing capacity (values only)

k) Code equation for computing bearing capacity (no derivation)

2. Highway Surveys and Traffic Engineering

a) Alignment – Factors influencing alignment of road in plain and hilly areas – Highway surveys – Reconnaissance, preliminary and final location surveys.

b) Traffic census and its importance.

c) Road intersections – At grade intersections-Types–Traffic islands – Channelizing islands – Round about – Interchange – Fly over – Diamond intersections – Clover Leaf junction.

d) Pavement marking and Kerb markings.

e) Traffic signs – Informatory signs – Mandatory signs – Cautionary signs.

3. Highway constructions and Maintenance

a) Purpose of road drainage – Surface and sub-surface drainage – Typical cross section of highway in cutting and embankment.

b) Water bound macadam roads – Materials used – Machinery used in the construction – Construction procedure – Maintenance of W.B.M road.

c) Bitumen – Properties – Tests on Bitumen (Flash Point and consistency tests) – Bitumen roads-Different types – Surface dressing – interface treatments-seal coat, tack coat, prime coat, premix – Full grout and semi-grout – methods – Construction procedure.

d) Cement concrete roads-Longitudinal joints–Transverse joints –Construction joints – Construction of cement concrete roads – Machinery used for construction.

4. Introduction and permanent way of Railways

a) Importance of Railways – Gauge – Types of gauges.

b) Structure of permanent way-Different types of rails- requirements of a good rail.

c) Rail joints – Types of joints – Requirements of good rail joint – Fixtures and fastenings of rails – coning of wheels.

d) Sleepers – Definition –Functions –-Types of sleepers–characteristics of a good sleeper – Spacing of sleepers – Sleeper density.

e) Ballast – Definition – Function – Characteristics of good ballast.

5. Station yards and Maintenance of Railways

a) General description and sketches for turnout – General layout of a simple left hand and right hand turnout and different crossings.

b) General idea with sketches of station yards – Marshalling yard, goods yard, passenger yard and loco yard.

c) Maintenance of track – Duties of P.W.I (permanent way inspector).

6. Bridges, Culverts and Causeways

a) Bridges – Classification based on material, position of bridge floor and form/type of superstructure – Selection of site for a bridge.

b) Technical terms waterway, Afflux, vertical clearance, linear waterway, freeboard for bridges and culverts – Economical span – Scour depth .

c) Pier, abutment, wing wall and approaches – Functions of each.

d) Deck and Through bridges – Sketches and suitability of different types of bridges – Masonry bridges – R.C.C beam and slab bridges, Plate girder bridges, pre stressed concrete bridges, steel trussed bridges and suspension Bridges.

e) Sketches and suitability of different culverts – slab culverts, pipe culverts and box culverts – Types of cause ways – Low level causeway and high level causeway.

REFERENCE BOOKS

1.	Highway Engineering	by	S.C.Rangawala
2.	Railway Engineering	by	S.C.Rangawala
3.	Bridge Engineering	by	S.C.Rangawala
4.	Highway Engineering	by	Khanna and Justo
6.	Railway Engineering	by	Saxena
7.	A Text book of Road Engineering	by	Basu and Bhattacharjee

CAD PRACTICE

Subject Title : CAD PRACTICE
Subject Code : CE - 406
Periods/Week : 06
Periods/semester : 90

TIME SCHEDULE

S.No.	Major Topics	No. of Periods
1.	Introduction to Computer aided Drafting	06
2.	Practice on CAD software	24
3.	Geometric Constructions	15
4.	Preparation of 2-D drawings using CAD Software	21
5.	Preparation of 3-D drawings using CAD software	24
	Total	90

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the importance of Computer Aided Drafting (CAD)

1.1 State the applications and advantages of CAD
1.2 State the advantages of CAD
1.3 State the features of CAD as drafting package
1.4 State the hardware requirements to run CAD

2.0 Practice to start the CAD, drawing editor and selects/enters CAD Commands to perform any operations

2.1 Study the drawing editor screen.
2.2 Practice the methods of selecting/entering commands to start new drawing accessing CAD commands by selecting from menus, tool bars and entering Commands on command line.
2.3 Set the limits of the drawing to get the needed working area.
2.4 Practice the 'setting commands' Grid, Snap, & Ortho Commands.
2.5 Practice 'Draw commands'- point, line, pline, rectangle, circle, tangent, ellipse, arc, polygon and spline.
2.6 Dimension the given figures.
2.7 Practice 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit.
2.8 Practice 'construct commands' – offset, array, Divide measure.

2.9 Practice 'edit commands' – Undo, Redo, Oops, Copy Clip, Paste Clip, Del.
2.10 Practice 'view commands' – Redraw, Regen, Zoom, Pan.
2.11 Practice 'Hatch commands' – Bhatch, Hatch.
2.12 Practice 'insert commands' – Block, Wblock, Insert, Minsert.

3.0 Practice Geometric Constructions using CAD commands

3.1 Practice dividing a line into number of segments.
3.2 Practice drawing external/internal common tangents for circles of same/different radii.
3.3 Practice drawing external/internal common arcs for circles of same/different radii.
3.4 Practice construction of ellipse, parabola, hyperbola, cycloid, and helix.

4.0 Practice 2-D drawings using CAD Software

4.1 Practice conventional signs used in civil engineering.
4.2 Practice drawing elevation of panelled door partly panelled and partly glazed door/window shutter.
4.3 Practice drawing cross section of Load bearing wall showing different components.
4.4 Practice drawing Plan, Elevation, section and site plan of one roomed building.
4.5 Practice drawing Plan, Elevation, section and site plan of 2BHK building.
4.6 Practice drawing Double line diagram of primary school building.
4.7 Practice drawing Plan of Rural Hospital.
4.8 Practice drawing typical floor Plan of Apartment.

5.0 Practice 3-D drawings using CAD Software

5.1 Practice different views under view option.
5.2 Practice Solid creation and Solid editing options available in CAD.
5.3 Practice drawing different 3D solid objects.
5.4 Practice drawing3D views of pyramids and isolated column footing.
5.5 Practice drawing Simple spread/wall foundation.
5.6 Practice drawing single/double roomed building in 3D.

KEY competencies to be achieved by the student

S.NO.	Experiment Title	Key Competency
1.	Introduction to computer	• Open/close Auto CAD program • Understands Auto CAD Graphic User Interface(GUI) and various toolbars
2	Practice on CAD software	• Practices the methods of selecting/entering commands • Sets the limits of the drawing • Learns Draw commands • Learns Modify commands • Learns Edit commands • Learns View commands • Learns Hatch commands • Learns Dimensioning Commands
3	Geometric Constructions	• Draws simple geometrical shapes like circles, tangents
4	Preparation of 2-D drawings using CAD Software	• Draws 2-D drawings
5	Preparation of 3-D drawings using CAD software	• Learns 3-D commands • Draws simple 3-D elements • Draws 3-D views of Isolated Column footing • Draws 3-D views of wall foundation • Draws 3-D views Single roomed and double roomed building in 3D

COURSE CONTENT

1.0 Introduction to computer aided drafting (CAD)

a) Computer graphics
b) Definition of CAD
c) Applications of CAD
d) Advantages of CAD
e) Introduction to CAD as drafting package

2.0 Practice on CAD

a) Study of drawing editor screen
b) List the methods to access CAD commands.
c) Practice of setting up of drawing area using utility commands, and using setting commands.
d) Practice entity draw commands.
e) Draw the given geometrical figures using draw commands.
f) Practice of Modify commands.

g) Practice of construct commands.
h) Practice of edit commands
i) Practice of view commands.
j) Practice of Hatch commands.
k) Practice of insert commands.
l) Dimension the figures using dimensioning commands.
m) Practice of Print/Plot commands

3.0 Geometric Constructions

a) Divide a line into number of segments.
b) Draw an external/internal common tangent for two given circles of same/different radii.
c) Draw external/internal arcs for two given circles of same/different radii.
d) Construct ellipse, parabola, hyperbola, cycloid, and helix.

4.0 Preparation of 2-D drawings using CAD Software

a) Draw conventional signs, symbols used in civil engineering drawing.
b) Draw the elevation of fully paneled door, partly glazed and partly paneled door/window shutter.
c) Draw the section of a load bearing wall.
d) Prepare Building Drawing – One roomed building with site plan.
e) Prepare Building Drawing - 2BHK building with site plan.
f) Prepare plan of primary school Building.
g) Prepare Plan of Rural Hospital building.
h) Prepare a typical floor plan of Apartment consisting G+5 floors.

5.0 Preparation of 3-D drawings using CAD Software

a) Practice 3D commands. – View commands – solids command – solid editing/modify commands.
b) Draw 3-D view of different simple objects.
c) Draw 3D view of Isolated Column footing.
d) Draw 3D view of wall foundation.
e) Draw Single roomed roomed building in 3D.
f) Draw double roomed building in 3D.

BUILDING SERVICES DRAWING

Subject Title : Building Services Drawing
Subject Code : CE- 407
Periods / week : 03
Periods / Semester : 45

TIME SCHEDULE

Sl.No.	Major Topics	Periods	Weightage of Marks	Short Answer Type	Essay Answer Type
1.	Plumbing	15	41	02	01
2.	Electrical	15		02	
3.	Mechanical	15	19	01	01
	Total	45	60	05	02

Note: All questions are to be answered. Part-A 5X4=20 marks & Part-B 2X20=40 marks

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Label the component parts in plumbing

1.1 Draw the water supply and sanitary pipe network diagram for a toilet
1.2 Draw the water supply and sanitary pipe network diagram for a Kitchen room
1.3 Draw the pipe networking diagram for a motor room
1.4 Draw the plan and cross section sharing the water supply and drainage connections from water main to a residential building
1.5 Draw 1. Plan and 2. Cross section of a rain water harvesting pit in a residential building

2.0 **Label the component parts in electrical connections**

2.1 Draw the wiring diagram for the following:
  (a) Two way switch
  (b) Connection to three phase motors
  (c) Connections in the Distribution board
2.2 Draw the electrical layout diagram for a given residential building

3.0 Label the component parts in mechanical connections

3.1 Draw 1. Plan and 2. Cross section of a lift well and motor room sharing the lift machine accessories.

3.2 Draw 1. Plan and 2. Cross section of ducting air conditioning system for a given room.

3.3 Draw the typical layout of a solar water heating system.

COURSE CONTENT

I.0 Plumbing

1.1 Water supply and sanitary connections to a toilet
1.2 Water supply and sanitary connections to a kitchen room
1.3 Layout and network diagram fro a motor room
1.4 Water supply connections to a residential building
1.5 Rain water harvesting pit
1.6 Septic tank with details of connections to a soak pit

2.0 Electrical engineering drawing

2.1 Labeling the parts of electrical connections in a residential building.

a) Two way switch
b) Three phase motor
c) Distribution board

2.2 Layout of a residential building and labeling the component parts.

3.0 Mechanical Engineering Drawing

3.1 Lift well and motor room
3.2 Ducting air conditioning system for a room
3.3 Solar water heater system

REFERENCE BOOKS

1. Building Technology and valuation by TTTI, Madras; Tata McGraw Hill Publishing Company Limited, New Delhi.

2. Services in Building Complex by Er. V.K. Jain Khanna; Khanna Publishers – Delhi.

Communication Skills Lab Practice
(Common to all branches)

Subject title : Communication skills Lab Practice
Subject code : CE- 408
Periods per week : 03
Periods per semester : 45

Introduction :
In the context of globalization , competence in speaking skills is the need of the hour The gap between the needs of the industry and the curriculum can be bridged by enabling the students to hone their speaking and listening skills. This course aims at providing opportunities for practicing speaking.

Objectives :
On completion of the course the students will be able to

- Strengthen their listening skills
- Strengthen their speaking skills

Time Schedule

Sno.	Topic	Periods	Weightage of marks (End Exam)	Sessional marks	Total
1	Listening I	3	10	10	20
2	Listening II	3			
3	Introducing oneself	3	50	30	80
4	Describing objects	3			
5	Describing events	3			
6	Reporting past incidents	3			
7	Speaking from observation / reading	3			
8	JAM	6			
9	Group discussion	6			
10	Mock interviews	6			
11	Making presentations	6			
		45	60	40	100

Competencies and key competencies to be achieved by the student

Topic	Teacher's input/ methodology	Students competence
Listening I Listening II	Pre- Listening –eliciting, pictures While - Listening Post –Listening –project , writing	Identifying the main idea, Identifying specific details, Identifying parallel and contradictory ideas Drawing inferences, Reasoning
Introducing oneself	Kinds of introduction --official/ personal, dynamic vocabulary, Body language, Model introduction, Use of line ups	Use of simple present tense, Sequencing, Appropriate vocabulary
Reporting incidents	Group work /pair work, Elicit, Use of past tense, Student presentations	Use of past tense, Relevant vocabulary
Describing objects	Vocabulary , Use of adjectives, Games—I spy, Group presentations	Use of adjectives, Dimensions,shapes Compare and contrast, sequence
Describing events	Group work/pair work Use of appropriate tense	Use of appropriate tense, sequencing
Reporting past incidents	Use of past tense, Vocabulary Student presentations	Use of past tense , sequencing
Speaking from observation/reading	Group work/pair work, Reading techniques ,	Use of past tense, Summarising , evaluating, comprehension
JAM	Effective techniques , Good beginning , conclusion, tips, Use of line ups	Vocabulary, Sequencing, Fluency, Thinking spontaneously
Group discussion	Expressing opinion, body language,	Expressing opinion, agree/ disagree, fluency,Persuasive and leadership skills
Mock interview	FAQs , body language	Role play, body language,
Making presentations	Student presentations	Using charts , pictures, interpreting data, sequencing,PPTs

Communicative methodology (CLT) should be used to create an interactive class. Apart from the suggestions given teachers are free to innovate to use any activity to improve the language competence of students . Attention can also be given to improve the accent and intonation of students.

Note:

* This subject is a theory subject.

** The workload should be calculated as theory workload.

***Examinations in the subject will be treated as a practical one.

SURVEYING – III PRACTICE

Subject Title : SURVEYING – III PRACTICE
Subject Code : CE - 409
Periods/Week : 06
Periods/semester : 90

TIME SCHEDULE

S.No.	Major Topics	No. of Periods
1.	Field Exercises using Theodolite	20
2.	Setting out curves	15
3.	Field Exercises using Total Station	40
4.	Global Positioning System	10
5.	Digitization of Maps	05
	Total	90

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0. Perform the operations using Theodolite

Determine the Height and Reduced Level of an object whose base is accessible.

1.2 Determine the Height and Reduced Level of an object whose base is inaccessible. (Object, instrument stations are in the same vertical plane)

1.3 Determine constants 'K' and 'C'.

1.4 Determine Horizontal Distance and Elevation by principle of stadia Tacheometry.

2.0. Sets out Simple curve

2.1 Using Chain and Tape.

2.2 Using One Theodolite.

2.3 Using Two Theodolites.

3.0. Field Exercises using Total Station

3.1 Study of component parts, accessories and functions Total Station.

3.2 Initialization of Total Station over ground station and measure the distance between two given points.

3.3 Measure area of given field.

3.4 Conduct traversing survey (closed Traverse).

3.5 To find Height and width of an elevated object.

3.6 To determine the elevation of Instrument point by making observation to point with known elevation.
3.7 To measure multiple sets (rounds) of observations.
3.8 To perform a station setup on a known point by making observations to one or more back sight points.
3.9 To establish the position of an occupied point relative to a base line or a boundary line.
3.10 To mark or establish points, Lines and Arcs on the ground.
3.11 To mark Centre line of a building on the ground.
3.12 L.S and C.S of proposed road/canal/pipe line on the ground.
3.13 Understand post processing.
3.14 To plot contour map of an area using surfer software.

4.0. Global positioning system

4.1 Identifies the parts and the functions of Global Positioning System.
4.2 Determines the Coordinates of various points on the ground.
4.3 Linking the G.P.S data with Total Station.

5.0. Digitization of Maps

5.1 Study the concept of digitization.
5.2 Digitization of any given contour map.
5.3 Digitization of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc.,

KEY competencies to be achieved by the student

S.NO.	Experiment Title	Key Competency
1.	Field Exercises using Theodolite a) Ex 1.1 b) Ex1.2 c) Ex1.3 d) Ex1.4	• Finds the height and reduced level of an object whose base is accessible • Finds the height and reduced level of an object whose base is inaccessible • Calculates constants K &C • Finds Horizontal Distance and Elevation of an object
2	Setting out curves a) Ex 2.1 b) Ex 2.2 c) Ex 2.3	• Sets out a given simple curve using chain and tape • Sets out a given simple curve using one Theodolite • Sets out a given simple curve using Two Theodolite
3.	Field Exercises using Total Station a) Ex3.1 b) Ex3.2	• Places total station on tripod, checks batteries and switches on total station • Centering of total station over a given point and sighting reflecting prism to measure distance • Measure area of given field • Conduct traversing survey (closed Traverse) and gets plotting

	c) Ex3.3 d) Ex3.4 e) Ex3.5 f) Ex3.6	• Finds Height and width of an elevated object • Finds the elevation of Instrument point by making observation to point with known elevation • Understands errors by taking multiple sets (rounds) of observations • Knows station setup on a known point by making observations to one or more back sight points • Establish the position of an occupied point relative to a base line or a boundary line • Establish points, Lines and Arcs on the ground • Locates Centre line of a building on the ground • Collects data for L.S and C.S of proposed road/canal/pipe line on the ground • Understand post processing • Plots contour map of an area using SURFER software
S.NO.	Experiment Title	Key Competency
4	Global Positioning System a) Ex 4.1 b) Ex4.2 c) Ex4.3	• Identifies the parts and the functions and learns operating GPS • Determines the Coordinates of various points on the ground • Linking the G.P.S data with Total Station
5	Digitization of Maps a) Ex5.1 b) Ex5.2 c) Ex5.3	• Understands software • Digitizes of any given contour map. • Digitizes of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc.,

COURSE CONTENT

1.0. Field Exercises using Theodolite

a) Determination of Height and Reduced Level of Top and Bottom of Accessible Object.

b) Determination of Distance and Elevation of an inaccessible object involving two instrument stations.
c) Determination of Constants of Tacheometer.
d) Determination of Horizontal distance and elevation by stadia Tacheometry.

2.0. Setting out curves

a) Setting out a simple curve by chain and tape method.
b) Setting out a simple curve by one Theodolite and two Theodolite methods.

3.0. Field Exercises using Total Station.

a) Study of the Total Station equipment.
b) Station setup and measuring distance.
c) Measurement of area.
d) Traversing with total station.
e) Height and width of the elevated object.
f) Orientation of Total Station by resection method.
g) Establishing T.B.M by Station Elevation Method.
h) Measure rounds (multiple sets of observations on a single station).
i) Station setup plus.
j) Refline.
k) Staking out a point, line and an arc.
l) Marking of the centre line for proposed residential building.
m) L.S and C.S of a proposed road/Canal/pipeline.
n) Contouring.
o) Post processing.

4.0. Global positioning system.

a) Applications of Global Positioning System
b) Parts and the functions of G.P.S.
c) Finding the Coordinates of various points on the ground.
d) Linking G.P.S data with Total Station.

5.0. Digitization of Maps.

a) Introduction – uses and applications.
b) Raster to vector conversion – scanning - Digitization.
c) Digitization of contour map from scanned picture.
d) Digitization of Town maps – showing the different layers for roads, railways, water supply lines and drainage lines etc,.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE-501	Design & Detailing of R.C. Elements	5	-	75	3			100
CE-502	Environmental Engineering - I	4		60	3			100
CE-503	Quantity Surveying - II	5	-	75	3			100
CE-504	Irrigation Engineering	5	-	75	3			100
CE-505	Project Management for Construction	4	-	60	3			100
PRACTICAL:								
CE-506	Computer Applications for Project Management		3	45	3			100
CE-507	Civil Engineering Drawing - II	-	6	90	3			100
CE-508	Life skills	-	3	45	3			100
CE-509	Field practices	-	7	105	3			100
TOTAL		23	19	630				900

DESIGN AND DETAILING OF R.C. ELEMENTS

Subject Title : DESIGN AND DETAILING OF R.C. ELEMENTS
Subject Code : CE-501
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S.No	Major **Topics**	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Introduction to R.C.C and Principles of Working Stress Method	08	10	-	01
2.	Philosophy of Limit State Design	04	06	02	-
3.	Analysis and Design of Rectangular Beams	15	26	02	02
4.	Design of Slabs	12	16	02	01
5.	Analysis of T-beams	08	13	01	01
6.	Design of continuous slabs and beams	10	16	02	01
7.	Design of columns	10	13	01	01
8.	Design of footings	08	10	-	01
	Total	75	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the Loads to be considered and importance of IS Codes and principles of working stress design

1.1 Differentiate Cement concrete and reinforced cement concrete.
1.2 Explain the need for reinforcement in plain concrete
1.3 List the advantages and disadvantages of R.C.C.
1.4 List the material used in R.C.C. and their functions in R.C.C.
1.5 State the reasons for using steel as reinforcement.
1.6 List the different codes used in RCC
1.7 List the Loads to be considered in the design of R.C. elements.
1.8 State the different methods of designing R.C. elements.
1.9 State the different grades of concrete and different permissible stresses in concrete (Working Stress Method) as per IS 456 – 2000.
1.10 Differentiate the nominal mix concrete and design mix concrete.
1.11 Write the equations of tensile strength and modulus of elasticity of concrete as per IS 456 – 2000.
1.12 State the following properties of concrete:
1. Poisson's ratio,
2. Creep,
3. Shrinkage,
4. Workability and
5. Unit weight.
1.13 List different types of steel and their permissible stresses in steel (Working Stress Method) as per IS 456 – 2000.
1.14 State modulus of elasticity and unit weight of steel.

1.15 State the assumptions made in Working Stress Method as per IS 456 – 2000.
1.16 Define modular ratio, know
1.17 Write the equation of modular ratio in working stress method
1.18 Sketch the stress distribution and transformed area of R.C. section.
1.19 Define:
1. Effective depth,
2. Neutral axis,
3. Lever arm and
4. Moment of resistance.
1.20 Describe the following with sketches:
1. Balanced section,
2. Under reinforced section and
3. Over reinforced sections
1.21 Calculate the following for a singly reinforced rectangular beam:
1. Neutral axis,
2. Lever arm and
3. Moment of resistance
1.22 Design a singly reinforced rectangular beam subjected to flexure.

2.0 Introduction to Limit state Design

2.1 Define Limit State.
2.2 State different limit states.
2.3 Distinguish 'strength' and 'service ability' limit states
2.4 Know the different IS: 456 – 2000 code provisions for Limit state method of design.
2.5 Define 1. 'characteristic strength' of materials and 2. 'characteristic loads'
2.6 Differentiate 'Nominal Mix' and 'Design Mix'
2.7 Explain the role of partial safety factors in limit state design.
2.8 Define 1.'Design strength of materials' and 2. 'Design loads'
2.9 State the assumptions made in the limit state design.
2.10 State the differences between the working stress method and limit state method of design of R.C. elements.

3.0 Understand the principles of analysis and design of singly reinforced and doubly reinforced R.C.C rectangular beams, by limit state method.

3.1 Sketch stress diagram and strain diagram for a singly reinforced rectangular beam indicating appropriate stress and strain values in compression zone and tension zone of the beam, also the strain value at the junction of parabolic and rectangular stress blocks.
3.2 Calculate the depth of rectangular and parabolic stress blocks.
3.3 Calculate the total compressive force and total tensile force resisted by the singly reinforced rectangular beam.
3.4 Calculate the depth of neutral axis from the equilibrium condition
3.5 Define lever arm
3.6 write the equation for lever arm for a singly reinforced rectangular beam.
3.7 Explain - why the over reinforced sections are not recommended?
3.8 Calculate the maximum depth of neutral axis.
3.9 Calculate the limiting value of moment of resistance with respect to concrete and steel
3.10 Calculate the limiting percentage of steel.

3.11 Know the general design requirements for beams in limit state design as per IS 456 – 2000
(Effective span, limiting stiffness, minimum tension reinforcement, maximum tension reinforcement, maximum compression reinforcement, spacing of main bars, Cover to reinforcement, side face reinforcement.)

3.12 Calculate the depth of neutral axis for a given section and decide whether the section is balanced or under reinforced or over reinforced and calculate the moment of resistance for the respective case.

3.13 Calculate the area of steel for a given beam with given cross section and loading.

3.14 Design a singly reinforced beam as per IS 456 – 2000 for flexure only with the given grade of steel and concrete and check the designed beam for deflection as per IS 456 – 2000.

3.15 Explain the effect of shear on beam.

3.16 Explain the shear stress distribution across a homogeneous section and reinforced concrete section with sketches..

3.17 Explain the design shear strength and maximum shear stress in different grades of concrete as per IS 456 – 2000.

3.18 Explain the need for shear reinforcement and different forms of shear reinforcement provided in beams.

3.19 explain the critical section for shear.

3.20 Calculate the shear strength of concrete, shear resistance of vertical stirrups, shear resistance of bent up bars as per IS 456 – 2000.

3.21 State the minimum shear reinforcement and maximum spacing of shear reinforcement as per IS 456 – 2000.

3.22 Calculate the nominal shear stress, shear resisted by bent up bars and spacing of vertical stirrups.

3.23 Design the shear reinforcement for beams.

3.24 Design a singly reinforced beam as per IS 456 – 2000 with the given grade of steel and concrete and check the designed beam for shear and deflection as per IS 456 – 2000 and design the shear reinforcement as per 456 – 2000.

3.25 State the situations which require doubly reinforced beams.

3.26 Determine the moment of resistance for a given doubly reinforced section (given d'/d – f_{sc} values)

3.27 Design a doubly reinforced beam with the given data.

3.28 Calculate the allowable working load on singly reinforced beam for the given span. and doubly reinforced beam for the given span.

3.29 Calculate the allowable working load on doubly reinforced beam for the given span.

3.30 Calculate the development length of bars in compression, tension, and the curtailment position for main tension bars.

3.31 State the importance of anchorage values of reinforcement.

3.32 Design a singly / doubly reinforced simply supported rectangular beams for the given grades of materials, span and loading, for flexure including shear design with the curtailment of reinforcements and check for the deflection using simplified approach of the code.

3.31 Design a independent lintel subjected to triangular loading.

4.0 Understand the principles involved in the design of R.C.C slabs by Limit state method.

4.1 Distinguish one-way slabs and two way slabs.
4.2 List the types of slabs based on support condition.
4.3 Explain the general design requirements of slabs as per IS 456 – 2000.
4.4 Explain the functions of distribution steel in slabs.
4.5 Sketch the general reinforcement details for a 1) one way slab simply supported on two parallel sides and 2) one way slab simply supported on four sides. 3) two way simply supported slab 4) one way continuous slab, 5) cantilever slab continuous over a support and 6) slab cantilevering from the top of a beam.
4.6 Explain the edge strip and middle strip of a two way slab.
4.7 Sketch the general reinforcement details for a continuous two way slab for its edge strip and middle strip using straight bars and bent up bars.
4.8 Design one-way slab for given grades of materials, loads and span for flexure and including shear check, check for deflection using stiffness criteria.
4.9 Explain Load distribution in two-way slabs. Design two-way slab with different end conditions for flexure including shear using B.M and S.F coefficients. Provide torsional reinforcement in the restrained slabs. Check the deflection using simplified approach of stiffness criteria.
4.10 Classify the stairs based on the structural behavior or support condition.
4.11 Sketch the detailing of reinforcement in stairs spanning longitudinally (Dog legged staircase only)

5.0 Understand the principles involved in the analysis of T-beams

5.1 Distinguish a T- beam and a L- beam.
5.2 List the advantages of a T- beam.
5.3 Write formula for effective width of flange of a T- beam and L- beam as per IS 456 – 2000.
5.4 Calculate the effective width of flange of an isolated T- beam as per IS 456 – 2000.
5.5 Describe the three cases of determining Neutral axis of T-beams with sketches and notations.
5.6 Calculate the depth of neutral axis and moment of resistance of the given Tee section using the expressions given in the code.
5.7 State the minimum and maximum reinforcement in T- beams as per 456 – 2000.

6.0 Understand the principles involved in the design of Continuous beams and slabs

6.1 Explain the behavior of continuous beams and slabs subjected to loading.
6.2 List the advantages of continuous beams or slabs.
6.3 Draw the line diagram of a continuous beam or slab and indicate the bending moment and shear force values at salient points as per IS 456 – 2000.
6.4 Sketch the position of sagging (+ve) and hogging (-ve) bending moments along the continuous beam or slab.
6.5 Sketch the general reinforcement details for a continuous beam or slab.
6.6 Calculate the B.M and S.F of continuous beams and slabs (Minimum of three spans) at critical sections using B.M and S.F coefficients given in the code.
6.7 Design a continuous beam or slab as per code at a given section only.

7.0 Understand Analysis and Design of columns

7.1 Define a column/ compression member

7.2 Differentiate among
1. Column,
2. Strut,
3. Pedestal and
4. Post

7.3 explain the need for providing reinforcement in column.

7.4 Explain the behavior of column under loading

7.5 Classify the columns based on type of reinforcement.

7.6 Classify the columns based on type of loading.

7.7 State the effective length of column for different end conditions as per theory and as per code.

7.8 Classify the columns based on slenderness ratio.

7.9 Define effective length of a column.

7.10 State the slenderness limits for column to avoid buckling of column.

7.11 State the minimum eccentricity of column.

7.12 Calculate the load carrying capacity of a short column with lateral ties and with helical reinforcement as per IS 456 – 2000.

7.13 Differentiate between short and long columns and understand their failure behavior.

7.14 Explain the design requirements of columns as per IS 456 – 2000.

7.14 Design a Short Square, rectangular, circular column with lateral ties (subjected to axial load only).

8.0 Understand Design of Footings

8.1 Define Footing

8.2 State different types of Footings (Square/ Rectangular Isolated footings of Uniform/Tapered sections).

8.2 State the Rankine's formula for minimum depth of foundation.

8.3 State the code provisions for the design of R.C.C footings.

8.3 Explain the procedure of checking the footing for one-way shear, two-way shear, bearing stress and for development length.

8.5 Design isolated square footing of uniform thickness under a column for flexure only.

Note: Students may be encouraged to use design aid SP-16, SP-34 and SP-23 for design of slabs, beams for general practice. I.S.456 – 2000 is allowed in the Examination.

COURSE CONTENT

1.0 Introduction to R.C.C and Principles of working stress method

1.1 Introduction to R.C.C, advantages and disadvantages of R.C.C., Loads to be considered and Introduction to I.S Codes and Assumptions in working stress method.

1.2 Behavior of concrete and steel under working loads.

1.3 Modular ratio – critical percentage of steel.

1.4 Balance, under reinforced, over reinforced sections.

1.5 Critical and actual neutral axis depth of singly reinforced beams.

1.6 Moment of resistance of simply supported singly reinforced beam sections.

1.7 Design of singly reinforced rectangular beam for flexure.

2.0 Philosophy of limit state Design

2.1 Codes of practice of R.C.C design
2.2 Characteristic compressive strength, modulus of elasticity of concrete.
2.3 Nominal Mix – Design Mix – differences.
2.4 Loads to be adopted in R.C.C. design – dead load, Live load, wind load(as per IS 875-1987) and earth quake loads(as per IS-1893).
2.5 Strength and serviceability limit states, characteristic strength of materials and characteristic loads and partial safety factors.
2.6 Design strength of materials and design loads.
2.7 Assumptions made in the limit state design.

3.0 Analysis and design of Rectangular beams

3.1 Stress-strain diagram of singly reinforced RCC beam.
3.2 Depth of neutral axis, lever arm.
3.3 Moment of resistance of singly reinforced Rectangular section – balanced, under reinforced.
3.4 Critical percentage of steel.
3.5 Calculation of moment of resistance of the given section and design of singly reinforced rectangular beam for the given load as per IS 456-2000.
3.6 Doubly reinforced sections - necessity, use.
3.7 Calculation of neutral axis and moment of resistance for the given section and grades of concrete and steel (no derivation of the equations).
3.8 Shear in singly reinforced beams - nominal shears stress, permissible shear stress.
3.9 Methods of providing shear reinforcement in the form of vertical stirrups - combination of vertical stirrups and bent up bars.
3.10 Code provisions for spacing of stirrups and minimum shear reinforcement (no derivation of equations).
3.11 Development of bond stress in reinforcing bars.
3.12 Design bond stress - development length – bond and anchorage concepts and their importance.
3.13 Curtailment of tension reinforcement.
3.14 Simple problems on development length.
3.15 Design of simply supported singly and doubly reinforced rectangular beam for flexure including shear and check for deflection using stiffness criteria - Use of design aids (SP-16).
3.16 Design of an independent lintel subjected to triangular loading.

4.0 Design of slabs

4.1 Slabs as structural and functional members
4.2 One way and two way slabs
4.3 Minimum reinforcement and maximum spacing of reinforcement – concrete cover -stiffness criterion- stiffness ratios for simply supported, cantilever and continuous slabs.
4.1 One way and two way slabs with various end conditions as per I.S:456 code.
4.2 Design of one-way slab for flexure and shear for the given grades of concrete, steel, span and loading.
4.4 Check for deflection using simplified approach of stiffness criteria.

4.5 Design of two-way slabs with different end conditions, using B.M and S.F coefficients for the unrestrained and restrained conditions as per code.
4.6 Design of torsion reinforcement for the restrained slabs – Deflection check using stiffness criteria - Use of design aids (SP-16).
4.7 Detailing of reinforcement in stairs spanning longitudinally.

5.0 Design of T-beam

5.1 Conditions needed for design of a beam as T-Section–advantages Code provisions for effective flange width - three cases of tee beams.
5.2 Neutral axis, lever arm and moment of resistance for under reinforced, balanced sections using the equations given in the code (no derivations).
5.3 Calculation of the moment of resistance of tee section using the equations given in the code – Use of design aids(SP16).

6.0 Design of Continuous beams and Slabs

6.1 Behavior of continuous members and advantages of continuous beams and slabs.
6.2 Determination of B.M and S.F of continuous beams and slabs of minimum three spans using BM & SF coefficients given in the code-Use of design aids(SP-16).
6.3 Design the tension and shear reinforcement at a given section only.

7.0. Design of columns

7.1 Definition of column – Difference between Column and Pedestal.
7.2 Types of columns (Long and Short) - effective length for different end conditions.
7.3 Code provisions for design of columns- square, rectangular and circular columns with lateral ties
7.4 Determination of Load carrying capacity of short column- square, rectangular, circular, helically reinforced column subjected to axial load only.
7.5 Design of short square, rectangular and circular columns (with lateral ties only).

8.0 Design of Footings

8.1 Footings - Need for footings
8.2 Footings under isolated columns – loads on footings
8.3 Code provisions for design of footings - size of footings for given bearing capacity
8.4 Procedure of checking the footing for one-way shear, two-way shear, bearing stress and for development length.
8.5 Design of an isolated square footing of uniform thickness under a column for flexure only.

REFERENCE BOOK

1. I.S:456- 2000
2. I.S:875-1987
3. Limit state design of R.C.C structures' by Ashok K.Jain, Nem chand brothers, Roorkee.
4. 'Limit state Design of concrete structural elements', continuing Education module prepared by N.I.T.T.T.R Chennai and published by I.ST.E continuing

education cell, university Visveswaraiah College of Engineering, (UVCE)Campus, Palare Road, Bangalore – 560001.
5. Structural Engineering(RCC) by S. Ramamrutham.
6. Structural Engineering (RCC) by Vazirani and Ratwani.
7. R.C.C Structural Engineering by Guru charan Singh.
8. Reinforced Concrete Structures by I.C.Syal and A.K.Goyal
9. Limit state design of reinforced concrete by P.C. Verghese
10. Concrete technology and practice by M.S Shetty
11 SP:34 - Handbook on concrete reinforcement and detailing.
12 Structural Design & Drawing by N. Krishna Raju (Universities press)
13 Reinforced Concrete Design by S, Unnikrishnan Pillai & Devdas Menon
14 Reinforced Concrete Design by S.N. Sinha (Tata Mc Graw Hill)

ENVIRONMENTAL ENGINEERING – I

Subject Title : Environmental Engineering - I
Subject Code : CE-502
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Environment and Ecology	04	03	01	-
2.	Water Supply Scheme	06	16	02	01
3.	Sources and Conveyance of Water	12	26	02	02
4.	Quality and Purification of Water	18	29	03	02
5.	Distribution System	20	36	02	03
	Total	60	110	10	08

OBJECTIVES
Upon completion of the subject the student shall be able to

1.0 Know about Environment and Ecology

1.1 Define Environment.
1.2 Define 1. Ecology and 2. Ecosystem.
1.3 Understand the various global environmental issues.
1.4 Define
1. Acid rain,
2. Green house effect,
3. Global warming and
4. Ozone layer depletion
1.5 List the causes and effects of
1. Acid rain,
2. Green house effect,
3. Global warming and
4. Ozone layer depletion
1.6 Differentiate renewable and non-renewable energy sources
1.7 List examples for renewable and non-renewable energy sources.
1.8 List the components of Ecosystem.
1.9 Explain the flow of matter and energy in an ecosystem.
1.10 List the factors affecting the stability of an ecosystem.
1.11 Explain the concept of sustainable development.

2.0 Know the scheme of water supply.

2.1 Explain the need for water supply schemes in the present day civil life.
2.2 Explain the connection between water supply engineering and public health.
2.3 State the need of protected water supply.
2.4 List the objectives of a protected water supply scheme.

2.5 Draw the flow chart of a typical water supply scheme of a town.
2.6 List the factors affecting per capita demand of a town/ city.
2.7 State the requirements of water for various purposes:
1. Domestic purpose,
2. Industrial use,
3. Fire fighting
4. Commercial and institutional needs and
5. Public use.
2.8 Explain the variation in demand for water supply.
2.9 Estimate the quantity of water required by a metropolitan area.
2.10 State the per capita demand for a small town for various purposes with a population of 50000
2.11 State the need for forecasting population in the design of water supply scheme.
2.12 State different methods of forecasting of population
2.13 Work out simple problems on forecasting population by different methods.

3.0 Understand the different sources and conveyance of water.

3.1 State the common sources of water for a water supply scheme
3.2 state different types of surface sources of water.
3.3 state different types of sub surface sources of water.
3.4 State the merits and demerits of surface and ground water sources for a water supply scheme of a town.
3.5 State the salient features of various surface sources.
3.6 Define
1. Aquifer,
2. Aquiclude and
3. Ground water table.
3.7 Classify wells according to construction.
3.8 Define
1. Draw down,
2. Critical depression of head,
3.Circle of influence,
4. Cone of depression,
5. Confined aquifer,
6. Unconfined aquifer and
7. Specific yield.

3.9 Explain the procedure for determining yield of a well by pumping tests (Constant Pumping and Recuperation Tests)
3.10 Explain the following with sketches:
1. Infiltration galleries.
2. Infiltration wells.
3.11 Describe the intakes for collection of water (reservoir intake, river intake, canal intake and lake intake) with sketches
3.12 Explain different methods of conveyance of water.
3.13 Explain as to why the raw water is carried from its source to city treatment plant through pressure conduits only.
3.14 List the merits of different types of pipes used for conveyance of water.
3.15 List the demerits of different types of pipes used for conveyance of water.

3.15 Explain different joints used for connecting pipes with sketches

1.16 Describe the standard method followed in laying and testing the water supply mains.

4.0 Understand the Quality as per IS code and methods of purification of water

4.1 State different types of impurities present in water.

4.2 State the need for laboratory tests for testing water.

4.3 Explain the method of obtaining samples for testing.

4.4 Explain different tests for analyzing quality of water with their significance.

4.5 Define
1. E-coli index and
2. Most Probable Number (MPN).

4.6 Explain the significance of E-Coli in water analysis.

4.7 Explain the importance of chemical and bacteriological analysis of water used for domestic purpose.

4.8 State the various water borne diseases in India.

4.9 State the maximum acceptable limits of the following for the public drinking water:
1. Turbidity,
2. Hardness,
3. Nitrates and
4. Fluorides

4.10 State the objectives of treatment of water.

4.11 Sketch the overall layout of a water treatment plant indicating the different stages.

4.12 List the points to be considered in the location and layout of treatment plant.

4.13 State the objects of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation,
4. Filtration and
5. Disinfection.

4.14 Explain the process of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation and
4. Filtration

4.15 Describe different types of sedimentation tanks.

4.16 Describe the construction and operation of
1. Slow sand filters,
2. Rapid sand filters and
3. Pressure filters and compares them.

4.17 Compare
1. Slow sand filters,
2. Rapid sand filters and
3. Pressure filters

4.18 List the type of filters suitable for
1. Public purpose,
2. Industrial use and
3. Swimming pools.

4.13 Define disinfection of water
4.14 Explain the need for disinfecting water
4.14 Explain the methods of disinfection of water.
4.15 Explain different forms and points of Chlorination.
4.16 List the substances responsible for causing colour, taste and odour in water.
4.17 Explain the temporary hardness and permanent hardness of water
4.18 Explain various methods of removal of hardness of water.

*NOTE: no design of treatment units.

5.0 Understand the systems of distribution and Water supply arrangements in Buildings

5.1 State the requirements of good distribution system.
5.2 Classify distribution system.
5.3 Explain different systems of distribution with sketches
5.4 State different methods of water supply system.
5.5 Explain different methods of water supply system with their merits and demerits.
5.6 List the merits of water supply system
5.6 State the necessity for service reservoirs.
5.7 Draw sketches of rectangular overhead service reservoir showing all accessories.
5.8 Explain with sketches the different layouts in distribution system.
5.9 List the merits and demerits of layouts with their suitability for a given locality.
5.10 List various appurtenances used in a distribution system of water supply system to a town.
5.11 Explains with sketches the location and functioning of various appurtenances used in a distribution system of water supply.
5.12 Explain methods of detecting leakages.
5.13 Explain methods of rectification and prevention of leakages in water supply mains.
5.14 Define terminology used while making water supply arrangements in buildings.
5.15 State the principles in laying pipelines within the premises of a building.
5.16 Explain the general layout of water supply connections of buildings with mains and suggests a suitable interior water supply arrangements for single and multi-storied buildings as per I.S Code.
5.17 State the general precautions to be taken in plumbing work for buildings.
5.18 Describe the constructional details and uses of different fittings: ferrule, goose neck, stopcock.

COURSE CONTENT

1. Environment and Ecology

1.1 Environment – Biosphere – Atmosphere – Acid rain, Green house effect , global warming – Ozone layer depletion.

1.2 Renewable and non-renewable energy sources with examples.

1.3 Ecology and Ecosystem – components of ecosystem – Flow of matter in an ecosystem (food pyramid) – Flow of energy in an ecosystem –Ecological balance and stability of an ecosystem – Sustainable development with examples.

2. Introduction to Water Supply Scheme and Quantity of water

2.1 General importance of water supply.

2.2 Development of Water supply.

2.3 Need for protected Water supply.

2.4 Flow chart of a typical water supply scheme.

2.5 Total quantity of water for a town, per capita demand and factors affecting demand.

2.6 Water requirements for domestic purposes, industrial use, fire fighting, commercial and institutional needs, public use.

2.7 Variation in demand - peak demand – seasonal, daily and hourly variation.

2.8 Forecasting population by arithmetical, geometrical and incremental increase methods-problems on above methods.

3. Sources and Conveyance of Water

3.1 Surface source- Lakes, streams, rivers and impounded reservoirs.

3.2 Underground sources-springs, wells, infiltration wells and galleries.

3.3 Yield from wells by constant pumping and recuperation tests. (No problems required)

3.4 Comparison of surface and subsurface sources.

3.5 Types of intakes:

(i) Reservoir intake;
(ii) River intake;
(iii) Canal intake.
(iv) Lake intake.

3.6 Conveyance of water-open channels, aqueduct pipes.

3.7 Pipe Materials - C.I Pipes, Steel Pipes, concrete pipes, A.C. Pipes, G.I. Pipes Plastic Pipes (PVC &HDPE), merits and demerits of each type.

3.8 Pipe joints - spigot and socket joint, flange joint, expansion joint for C.I. Pipe, joints for concrete and asbestos cement pipes.

3.9 Pipe Laying and testing-Leak detection-prevention-rectification.

4. Quality and Purification of water.

4.1 Impurities of water - need for laboratory test – sampling- grab and composite sampling.

4.2 Tests of water - physical, chemical and bacteriological tests – P**H** value of water.

4.3 Standard quality for domestic use and industrial purposes.

4.4 Flow diagram of different treatment units.

4.5 Aeration - methods of aeration.

4.6 Sedimentation - plain sedimentation and sedimentation with coagulation.

4.7 Filtration - Construction and operation of slow sand rapid sand pressure filters.

4.8 Disinfection of water - necessity and methods of chlorination , pre-chlorination, break point chlorination
4.9 Colour, taste and odour control
4.10 Hardness – Types of Hardness - Removal of hardness.
NOTE: No design of treatment units

5. Distribution system and water supply arrangements in a Building.

5.1 General requirements, systems of distribution - gravity system, combined system, direct pumping.
5.2 Methods of supply - Intermittent and continuous.
5.3 Storage - underground and overhead-service reservoirs - necessity and accessories.
5.4 Types of layout - dead end, grid, radial and ring system their merits and demerits and their suitability.
5.5 Location and functioning of:
(i) Sluice valves.
(ii) Check valves or reflux valves.
(iii) Air valves.
(iv) Drain valves or blow-off valves
(v) Scour valves.
(vi) Fire Hydrants.
(vii) Water meters.
5.6 Water supply arrangements in building:
Definition of terms; water main, service pipe, communication pipe, supply pipe, distribution pipe, air gap.
5.7 General lay out of water supply arrangement for single and multi-storeyed buildings as per I.S Code of practice-general principles and precautions in laying pipelines within the premises of a building.
5.8 Connections from water main to building with sketch.
5.9 Water supply fittings, their description and uses - stopcock, ferrule, goose neck etc.

REFERENCE BOOKS

1. Environmental Engineering – G.S. Birdie
2. Elements of Public Health engineering – K.N. Duggal
3. Environmental Engineering – Baljeet Kapoor
4. Public Health Engineering – S.K. Hussain
5. Water supply and sanitary Engineering – V.N. Vazirani.
6. Environmental Engineering --N.N.Basak /TMH
7. Water Supply Engineering - S.K. Garg

QUANTITY SURVEYING II

Subject Title : Quantity Surveying - II
Subject Code : CE-503
Periods / week : 05
Periods / Semester : 75

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Detailed estimate of RCC elements	08	13	01	01
2.	Estimation of quantity of steel in RCC elements	09	16	02	01
3.	Analysis of Rates and Abstract Estimates	22	29	03	02
4.	Detailed estimates of Roads and Culverts	18	26	02	02
5.	Detailed estimates of Irrigation and Public Health Engineering works.	18	26	02	02
Total:		75	110	10	08

OBJECTIVES

Upon completion of the SUBJECT the student shall be able to

1.0 Prepare the estimate for RCC Structural elements

1.1 Explain types of staircases
a) Dog legged staircase
b) Open well staircase

1.2 Prepare detailed estimates of
1. Dog legged staircase and
2. Open well staircase.

2.0 Prepare the estimates for steel reinforcement for different R.C.C elements

2.1 State different methods of estimation of steel required for R C C work involved in a building

2.2 Explain different methods of estimation of steel required for R C C work involved in a building

2.3 State covers for RCC items as per IS 456 : 2000
2.4 Distinguish between straight bars and cranked bars used in simply supported beams
2.5 Distinguish between main reinforcement and distribution reinforcement used in RCC slabs
2.6 Compute the quantity of steel reinforcement for different elements of R.C.C works in a building by preparing a bar bending schedule

3.0 Understand the Analysis of Rates and Abstract estimations

3.1 Define analysis of rates
3.2 Explain the purpose of analysis of rates
3.3 Explain the following in rate analysis:
- a) Standard data book
- b) Standard schedule of rates
- c) Standard data sheet

3.4 Explain cost of material at source
3.5 Explain cost of material at site
3.6 Explain the following terms:
- a) Blasting charges
- b) Seinorage charges
- c) Cess charges
- d) Stacking charges
- e) Water charges
- f) Crushing charges
- g) Lead charges

3.7 Compute rate of an item of work
3.8 Explain different types of labour wages as per latest SSR
3.9 Define lead statement
3.10 Prepare the format for Lead Statement
3.11 Prepare Lead Statement and data for different items of work
3.12 Prepare the unit rates for finished items of works using standard data and SSR
3.13 Tabulate the material requirement of mortars and concrete of different proportions
3.14 Prepare abstract estimate for the following buildings:
- a) Single bedroom building (1 BHK)
- b) Two bedroom building with verandah (2 BHK)
- c) Three bedroom building (3 BHK)

4.0 Prepare detailed estimates of roads and culverts

4.1 Prepare a detailed estimate for different types of roads and culverts
4.2 State the items involved in the abstract estimates of roads and culverts

5.0 Prepare the detailed estimates of irrigation and public health engineering structures

5.1 Prepare a detailed estimate for the following items:
- a) Open well
- b) R.C.C. overhead tank
- c) Septic tank with soak pit / dispersion trench
- d) Tank sluice with tower head

5.2 State the items to be included in the abstract estimates of above structures

COURSE CONTENT

1.0 Detailed estimate of RCC elements:

R C C Doglegged – Open well stairs

2.0 Estimation of quantities of steel in R C C elements:

a) Simply supported singly reinforced R C C beams / Lintel
b) Simply supported one- way slab
c) R C C column with square footing
d) Preparation of Bar bending schedule for above

3.0 Analysis of Rates and Abstract Estimates:

a) Cost of materials at source and at site
b) Standard Schedule of Rates of different materials in buildings works
c) Types of labour – Wages as per S S R
d) Lead and Lift – Preparation of Lead Statement
e) Data Sheets – Standard data for materials and labour components for different items of work
f) Preparation of unit rates for finished items of works using Standard data and S S R
g) Methods of calculating quantities of ingredients of various proportions of cement concrete.
h) Provisions for different building services and other over head charges
i) Prepare abstract estimate for:
   i) Single bedroom building (1 BHK)
   ii) Two bedroom building with verandah (2 BHK)
   iii) Three bedroom building (3 BHK)

4.0 Detailed Estimates of Roads and Culverts:

a) Gravel Road
b) Water bound macadam road
c) Surface dressing with bitumen
d) Cement concrete road
e) Pipe culvert
f) R C C slab culvert with i) straight returns and ii) splayed wing walls
g) Different items in abstract estimate (Labour charges, Traffic diversion etc)

5.0 Detailed Estimates of Irrigation and Public Health Engineering works:

a) Open well with masonry staining
b) R C C over head tank
c) Septic tank with soak pit / dispersion trench
d) Tank sluice with tower head.
e) Different items to be included in the abstract estimates of the above

REFERENCE BOOKS

1. Estimating and Costing - B.N. Dutta
2. Estimating and Costing - S. C. Rangawala
3. Estimating Construction Costs - Robert L. Peurifoy & Garold D. Oberlender

IRRIGATION ENGINEERING

Subject Title : Irrigation Engineering
Subject Code : CE-504
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Nature and scope of Irrigation Engineering	5	13	01	01
2.	Elements of Hydrology	5	13	01	01
3.	Head works	15	23	01	02
4.	Gravity dams and Earth dams	15	23	01	02
5.	Distribution works	15	16	02	01
6.	Soil Erosion, Water logging and River Training works	10	10	--	01
7.	Water Management	5	06	02	--
8.	Watershed Management	5	06	02	--
	Total	75	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the Nature and scope of Irrigation

1.1 Define Irrigation
1.2 Understand the necessity of irrigation.
1.3 List advantages of irrigation.
1.4 List disadvantages of irrigation
1.5 State different types of irrigation
1.6 Explain Perennial Irrigation
1.7 Explain Inundation Irrigation
1.8 Distinguish between
   1. Perennial and inundation irrigation,
   2. Flow and Lift irrigation, and
   3. Storage and Direct irrigation.
1.9 State Principal crops in India and their seasons
1.10 Explain Kharif crops
1.11 Explain Rabi Crops
1.12 Define the following terms:
   1. Duty,
   2. Delta,
   3. Base period and
   4. Crop period
1.12 Explain different methods of expressing duty
1.13 State the relationship between duty and delta.

1.14 Explain the factors affecting duty
1.15 State the requirement for precise statement of duty
1.16 State the duty figures for principal crops
1.17 Solve simple problems on duty

2.0 Understand the basic concepts of Hydrology

2.1 Explain the term Precipitation
2.2 State different types of rain gauges
2.3 Describe Simon's rain gauge
2.4 Explain the method of measurement of rainfall using Simon's Rain gauge
2.5 Describe Float type automatic recording rain gauge
2.6 Explain method of measurement of rainfall using float type automatic rain gauge
2.7 Explain precautions in setting and maintenance of rain gauges
2.8 State uses of rain fall records
2.9 Describe Hydrological cycle
2.10 Explain method of average annual rainfall of an area by Theisson's Polygon method
2.11 Solve the problem on calculation of average annual rainfall by Theisson's Polygon method
2.12 Define the following:
1. Catchment,
2. Intercepted catchment,
3. Free catchment and
3. Combined catchment area
2.13 State the characteristics of
1. Good catchment,
2. Average catchment and
3 .Bad catchment
2.14 Explain the term Run-off
2.15 Explain factors affecting runoff
2.16 Understand nature of catchment and runoff coefficient
2.17 Explain methods of estimating runoff using empirical formulae
2.18 Solve the problems on estimating run-off
2.19 Understand the term maximum flood discharge
2.20 Explain the methods of determining maximum flood discharge from rain fall records
2.21 State Ryve's and Dicken's Formulae
2.22 Understand HFL marks and gauge reading
2.23 Solve simple problems on estimating maximum flood discharge
2.24 Explain River gauging
2.24 Explain the importance of river gauging
2.25 Lists the factors for selecting suitable site for a gauging station

3.0 Understand head works for a diversion scheme and protective works for resisting percolation

3.1 Classify of head works
3.2 State the suitability of different types of head works under different conditions
3.3 State the factors for selecting suitable site for diversion head works
3.4 Describe the component parts of Diversion works with sketch
3.5 Describe with sketch the component parts of a weir
3.6 Distinguish between barrages and Weirs
3.7 Describe head regulator with sketch
3.8 Describe scouring sluice with sketch

3.9 Describe flood banks and other protective works
3.10 Define the following terms:
1. Percolation,
2. Percolation gradient,
3. Uplift and
4.Scour.
3.11 Explain percolation gradient
3.12 Explain uplift pressure
3.13 Explain the effects of percolation on irrigation works

4.0 Understand basic ideas about reservoirs, gravity dams and Earth dams
4.1 Distinguish between Rigid dams and Non-rigid dams
4.2 State factors influencing selection of site for reservoirs and dams.
4.3 Define the terms:
1. Full reservoir level,
2. Maximum water level,
3. Top bund level,
4. Dead storage,
5. Live storage,
6. Free board,
7. Gravity dam and
8. Spillway.
4.4 Explain the causes of failure of gravity dams and their remedies.
4.5 Distinguish between low and high dams.
4.6 Draw the elementary profile of a gravity dam for a given height
4.7 Draw the practical profile of a low dam.
4.8 Explain uplift pressure
4.9 Explain need for drainage galleries with sketches
4.10 Explain construction and contraction joints with sketches
4.11 State need and types of grouting of foundations
4.12 Explain the method of grouting of foundations in gravity dams
4.13 State different types of spillways and their suitability and draw sketches
4.14 State the situations in which earth dams are suitable
4.15 State the three types of earth dams with sketches of typical cross sections
4.16 Explain causes of failure of earthen dams and their precautions
4.17 Explain the terms with sketches
1.Saturation gradient and
2. Phreatic line
4.18 Explain drainage arrangements in earth dams with a neat sketch
4.19 State the method of constructing rolled fill earth dams and their maintenance.
4.20 Explain breach filling in earthen dams
4.21 Explain the maintenance of earth dams

5.0 Understand basic ideas about canals & cross masonry works
5.1 Classify canals.
5.2 State the different methods of canal alignment and the situations in which each is suitable.
5.3 Sketch typical cross sections of canals
1. In cutting,
2. Embankment and
3. Partial cutting.

5.4 Explain balanced depth of cutting and its necessity
5.5 State the need for canal lining
5.6 State advantages of canal linings
5.7 State disadvantages of canal linings
5.8 Explain different types of canal linings
5.9 Explain the maintenance required for canals and their regulation
5.10 Explain Lacey's regime theory and Kennedy's silt theory(only explanation of formulae)(No problems)
5.11 Compare Lacey's and Kennedy's silt theories
5.12 State different types of cross masonry works (cross regulator, drainage & Communication) and their objectives.
5.13 State need for cross drainage works
5.14 Describe the following with sketches
1. Aqueduct,
2. Super passage,
3. Under tunnel, siphon,
4. Level crossing and
5. Inlet and outlet

6.0 Understand the soil erosion, water logging and River training works

6.1 Explain terms:
1. Soil erosion,
2. Reclamation, and
3. Water logging.
6.2 State causes of soil erosion
6.3 State ill effects of soil erosion
6.4 Explain various methods of prevention of soil erosion.
6.5 State causes of water logging
6.3 State ill effects of water logging
6.4 Explain various methods of prevention of water logging
6.5 State methods of land reclamation.
6.6 State different stages of flow of rivers
6.7 Explain characteristics of Delta Rivers
6.8 Explain term meandering of river
6.9 State objectives of river training works
6.10 Explain various types of groynes and bell's bunds with sketches

7.0 Understand the principles of water management

7.1 State soil-water plant relationship.
7.2 Describe the following irrigation methods:
1. Broader irrigation,
2. Check basin irrigation,
3. Furrow irrigation,
4. Sprinkler irrigation and
5. Drip irrigation
7.3 Explain on farm development
7.4 Describe 1. Warabandi system and 2. Water user associations
7.5 State the duties of water user associations

8.0 Understand the basic ideas about watershed management

8.1 Explain the concept of
1. Water shed and
2. Water shed management

8.2 State the need for watershed management

8.3 List the objectives of watershed management

8.4 State need for watershed development in India

8.5 Describe different approaches to water shed management

8.6 Explain water harvesting

8.7 Explain methods of 1. Rain water harvesting and 2. Catchment harvesting

8.8 Explain soil moisture conservation methods

8.9 Explain method water harvesting through check dams

8.10 Explain different methods of artificial recharge of ground water

8.11 Explain artificial recharges of ground water using percolation tanks

COURSE CONTENT

1. Nature and scope of Irrigation Engineering

a) Definitions-necessity of irrigation-advantages and disadvantages-Perennial and Inundation irrigation-Flow and Lift irrigation-Direct and Storage irrigation.

b) Principal crops-Kharif and Rabi crops-Dry and wet crops.

c) Definition of duty, delta, base period, and crop period, Duty-different methods of expressing duty-base period-relationship between duty and delta- factors affecting duty – Requirements for precise statement of duty - Duty figures for principal crops-simple problems on duty.

2. Elements of Hydrology

a) Precipitation – Types of rain gauges – Simon's rain gauge - Float type automatic recording gauge – precautions in setting and maintenance – rain fall records – Hydrological cycle-average annual rainfall of an area – Theissen's polygon method.

b) Catchment basin in catchment area - Free catchment - combined catchment - Intercepted catchment – Run- off - Factors affecting run-off - Nature of catchment, run off coefficient - Methods of estimating run off Empirical formulae -

c) Maximum flood discharge - Methods of determining maximum flood discharge from rainfall records, Ryve's and Dicken's formulae, H.F.L Marks, Gauge reading – Simple problems on M.F.D.

d) River gauging – Importance – Site selection for river gauging

3. Head Works

a) Classification of head works-storage and diversion, head works - their suitability under different conditions-suitable site for diversion works - general layout of diversion works-brief description of component parts of diversion works, brief description of component parts of a weir.

b) Barrages and Weirs.

c) Head Regulator-scouring sluice-flood banks and other protective works.

d) Percolation-Percolation gradient-uplift pressures-effect of percolation on irrigation works.

4. Gravity dams and Earth dams

a) Dams-rigid and non-rigid dams - main gravity dams-failures of gravity dams and remedial measures - elementary profile – limiting height of dam-low dam and high dam - free board and top width – Practical profiles of low dam - uplift pressure - drainage gallery - Contraction joints - grouting of foundations - spillways

b) Earth dams – situations suitable for Earth Dams types of earth dams-causes of failure of earth dams and precautions –saturation gradient and pyretic line-drainage arrangements-construction details of earth dams-breaching sections-breach filling-maintenance of earth dams.

5. Distribution works

a) Canals-classification-different methods of canal alignment-typical cross section of canal in cutting embankment, partial cutting and embankment – Berms - standard dimensions - balancing depth of cutting-canal lining-necessity - types –maintenance of canals.

b) Lacey's regime Silt Theory and Kennedy's Silt Theory(only explanation of formulae)- Comparison of two theories (No problems)
c) Cross drainage works - Necessity – General description of aqueducts – Super passage – under tunnel - siphon level crossing- Inlet and outlet.

6. Soil erosion, Water logging and River Training works

a) Soil erosion-methods of prevention of soil erosion-causes and effects- of water logging-preventing water logging methods-land reclamation.
b) Different stages of flow of rivers-characteristics of Delta Rivers - Meandering - Object of river training - River training works- List out the various types of groynes and Bell's bunds.

7. Water management

Soil-water plant relationship-Irrigation methods-Broader Irrigation, check basin irrigation-Furrow Irrigation-Sprinkler irrigation-Drip irrigation – farm development, water user associations & Warabandi system.

8. Watershed Management

a) Introduction - Concept of Watershed Management – Objectives of watershed Management – Need for watershed development in India – Integrated and multidisciplinary approach for water shed management.
b) Water Harvesting: Rainwater harvesting, Catchment harvesting – Soil moisture conservation – Check dams – Artificial recharges and percolation tanks.

REFERENCE BOOKS

1. Irrigation Engineering by B.C Punmia
2. Irrigation Engineering and Water power Engineering by Birdie.
3. Irrigation Engineering by S.K.Garg
4. Irrigation Engineering by Basak-TMH

PROJECT MANAGEMENT FOR CONSTRUCTION

Subject Title : Project Management for Construction
Subject Code : CE-505
Periods/ week : 04
Periods/Semester : 60

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer type	Essay Type
1.	Introduction	3	3	1	0
2.	Organizational Aspects	10	16	2	1
3.	Management Tools	15	26	2	2
4.	acts and Tenders and Arbitration	17	36	2	3
5.	gement of Resources in Construction	6	13	1	1
6.	preneurship	6	13	1	1
7.	Human Relations and Professional Ethics	3	3	1	0
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the importance of project management

1.1. Define Management.
1.2. State the functions of Management.
1.3. State the need for scientific Management of projects.
1.4. Describe the fields level management.
1.5. Describe the sequencing of work

2.0 Understand the importance of Organizational Aspects

2.1. Explain the organizational structure of any Engineering department (Government).
2.2. List the duties of different officers of an Engineering department.
2.3. Define
1. Preliminary estimate,
2. Detailed estimate,
3. Administrative approval and
4. Technical sanction.
2.4. State the limit of powers of sanction by various officers in an Engineering Department (Government).
2.5. Give the Organizational structure of a public sector construction company.
2.6. Compare the Head quarters versus Regional and Project Management.
2.7. List the duties of Chief Engineer in a construction company.
2.8. List the duties of a Resident Engineer.

3.0 Understand the importance of Organizational Aspects

3.1. Define 1. CPM and 2. PERT.
3.2. State the advantages of CPM and PERT.
3.3. Explain the use of bar chart and its limitations
3.4. Define:
1. Network,
2. Activity,
3. Event,
4. Duration,
5. Dummy activity,
6. EST,
7. EFT,
8. LST,
9. LFT,
10.Total float,
11. Free float and
12. Critical path.
3.5. Prepare network diagram using basic rules of network formation.
3.6. Calculate time on CPM network identifying critical activities, critical path, free float and total float.
3.7. State the limitations of CPM.
3.8. Distinguishe between CPM and PERT.

4.0 Understand different contract, Tendering systems and Arbitration

4.1. Define contract
4.2. State the contents of a contract document.
4.3. Explain different contract systems available for construction works.
4.4. List the merits and limitations of each of the contract systems.
4.5. List the general conditions of contract for a civil engineering- construction project.
4.6. Define tender.
4.7. Explain the need for calling of tenders.
4.8. List the steps involved in fixing up agency through tender system.
4.9. Draft a tender notice for a work
4.10. Prepare tender documents.
4.11. Explain the need of earnest money and security deposits.
4.12. Prepare a comparative statement.
4.13. Explain the method of selecting a contractor from the tenders.
4.14. List out the conditions of contract agreements.
4.15. Define 1. Dispute and 2. arbitration.
4.16. Explain the scope for disputes in a construction industry.
4.17. State the need for arbitration.
4.18. List the qualifications of an arbitrator.
4.19. List the advantages of arbitration.

5.0 Understand the principles of management of Resources like Materials, Plant and Equipments and Money

5.1. Explain the scope of materials management.
5.2. Classify the common building materials based on the procurement.
5.3. Explain different Stages of materials management.

5.4. Explain the points to be observed in the storage of perishable and non-perishable store materials.
5.5. Explain the terms
1. Indent,
2. Invoice and
3.Bin card.
5.6. Explain the importance of verification of stores.
5.7. Explain the need for mechanization.
5.8. Explain the need for optimum utilization of plant and equipment.
5.9. Explain the financial impact of mechanization.
5.10. Explain about the preventive maintenance of plant and equipment.
5.11. Explain the importance of training of operators.
5.12. Explain the need for overhauling or replacement.
5.13. Explain the requirements of centering, shuttering and scaffolding
5.14. State the importance of finance as a resource.
5.15. State the purposes of cost control.
5.16. Explain the different stages at which cost control can be achieved.
5.17. Explain the financial control at head office level and site level.

6.0 Understand the role and characteristics of an entrepreneur

6.1. Define
1. Entrepreneur and
2. Entrepreneurship.
6.2. Outline the concepts of entrepreneurship.
6.3. State the role of entrepreneur in economic development.
6.4. List the characteristics of an entrepreneur.
6.5. Evaluate the risks and rewards of an entrepreneur.
6.6. State the role of financial institutions in entrepreneurial development.

7.0 Understand the role of Human relations and professional ethics in construction Industry

7.1. State role of
1. Human relations and
2. Performance in organization.
7.2. State the role of Interpersonal relationship for effective work culture.

COURSE CONTENT

1. **Introduction**

Definition and concept of management – need for scientific management of projects – need for attitudinal change – Scope and characteristics of construction Industry.

2. **Organizational Aspects**

Govt. organizations: Organizational structure of P.W.D. – duties of various officers – Preliminary estimates – detailed estimate – budget provision – administrative approval and technical sanction – powers of sanction.

Public sector organizations: Organizational structure of a construction company – Head quarters versus Regional and Project Management–Duties of Chief Engineer – preparation of bids – duties of Resident Engineer.

3. **Management Tools**

Different Management Tools – Gantt Bar chart, modified Gantt bar chart – Limitations of bar charts – Introduction CPM and PERT – advantages of CPM and PERT – terms used in CPM – formation of network – Basic rules – Problems on determination of critical path – limitations of CPM – comparison of CPM and PERT.

4. Contracts, Tenders and Arbitration

Contracts – Legality of contracts – contract document – types of contracts – piece work contracts – item rate contracts – Lump sum contracts – percentage contracts – negotiated rates – departmental execution of works – merits and limitations of each contract system – conditions of contract for civil engineering works.

Tenders – Necessity of tenders – Sealed tenders – tender notice – tender documents – Earnest Money and Security Deposits – Opening of tenders – comparative statement – acceptance of tenders – work order – contract agreement – conditions of contract.

Arbitration – Disputes – disputes in construction industry – arbitration – need for arbitration – arbitrator – qualifications of arbitrator – advantages of arbitration.

5. Management of Resources in Construction Industry

Materials management – Scope – Classification of common building materials based on the procurement – procedural formalities for acquisition – stages of materials management.

Plant and Equipment – Need for mechanization – Optimum utilization of plant and equipment – Financial impact of mechanization – Preventive maintenance – Overhauling and replacement – Centering, shuttering and scaffolding requirements. Financial Management – Finance as Resource – Purpose of cost control – stages of cost control – pre contract stage and post contract stage – Financial control at head office level and site level.

6. Entrepreneurship

Entrepreneur – concept, definition, role, expectation – characteristics of entrepreneur – risk and rewards of an entrepreneur – role of financial institution in entrepreneurial development.

7. Human Relations and Professional Ethics

Human relations and performance in organization – Understand self and others for effective behavior – Interpersonal relationship for effective work culture – Need for professional ethics.

REFERENCE BOOKS

1. Management in construction Industry – P.Dharwadker. Oxford & IBH Publishing Co. Pvt., Ltd.,
2. Construction Management And Accounts – V.N.Vazirani & S.P. Chandola. Khanna Publishers.
3. Construction Planning and Management . - U.K. Shrivastava Galgotia Publications Pvt. Ltd., New Delhi.
4. Construction Management and Planning -B. Sengupta & H. Guna Tata Mc. Grao Hill Publishing Company Ltd.
5. Construction Management and Accounts.- Harpal Singh. Tata Mc. Graw Hill Publishing Company Ltd.

COMPUTER APPLICATIONS FOR PROJECT MANAGEMENT

Subject Title : COMPUTER APPLICATIONS FOR PROJECT MANAGEMENT
Subject Code : CE - 506
Periods/Week : 03
Periods/semester : 45

TIME SCHEDULE

S.No.	Major Topics	No. of Periods
1.	Introduction to Project Management Software and Building Services softwares.	03
2.	Practice on Project Management software	12
3.	Practice on Software for Building Services	15
4.	Structural Design Drawings using STADD / SCADSS	15
	Total	45

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand Project Management Software and Building Services soft wares
- 1.1 State the features of Project management software.
- 1.2 State the applications of Project management software.
- 1.3 State the features of Building services soft ware.

2.0 Practice Project Management software
- 2.1 Understand various menus available in MS-Project.
- 2.2 Understand input data.
- 2.3 Understand various commands to execute the given input data.
- 2.4 Prepare schedules for resource allocation.
- 2.5 Prepare networks for execution of projects.

3.0 Practice on Software for Building Services
- 3.1 Understand various menus available in 4M-IDEA-BIM software.
- 3.2 Prepare Layout of HVAC design for a given multistoried building plan using 4M-IDEA software.
- 3.3 Prepare Layout of water supply and sewerage design for a given multi storied building using 4M-IDEA software.
- 3.4 Prepare Layout of Electrical design for a given multistoried building plan using 4M-IDEA software.
- 3.5 Prepare Layout of Lift design for a given multistoried building plan using 4M-IDEA software.

3.6 Prepares layout of fire fighting design for a given multistoried building plan using 4M-IDEA software.

4.0 Prepare Structural and Irrigation Drawings using CAD

4.1 Prepare R.C.C Drawings
- 4.1.1. Singly reinforced Rectangular beam
- 4.1.2. T-beam
- 4.1.3. Slab
- 4.1.4. Column with Footing.

4.2 Prepare Structural Steel Drawings
- 4.2.1. Built-up beams
- 4.2.2. Beam-column connection
- 4.2.3. Slab base and Gusseted base.

4.3 Prepare Irrigation Drawings
- 4.3.1. Earthen Bunds
- 4.3.2. Slab Culvert
- 4.3.3. Pipe Culvert.

KEY Competencies to be achieved by the students

S.NO	Experiment Title	Competencies	Key Competency
1.	Introduction to Project Management Software and Building Services softwares.	• Learns the applications of Project management software. • Learns the applications of Building services soft ware	• Learns the applications of Building services soft ware
2	Practice on Project Management software	• Learns various menus available in MS-Project • Learns inputting data • Learns various commands to execute the given input data • Prepares schedules for resource allocation • Prepares networks for execution of projects	• Learns various commands to execute the given input data • Prepares schedules for resource allocation • Prepares networks for execution of projects
3	Practice on Software for Building Services	• Learns various menus available in 4M-IDEA-BIM software. • Prepares Layout of HVAC design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of water supply and sewerage design for a given multi storied building using 4M-IDEA software. • Prepares Layout of Electrical design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of Lift design for a given multistoried building plan using 4M-IDEA software • Prepares Layout of fire fighting design for a given multistoried building plan using 4M-IDEA software	• Prepares Layout of HVAC design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of water supply and sewerage design for a given multi storied building using 4M-IDEA software. • Prepares Layout of Electrical design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of Lift design for a given multistoried building plan using 4M-IDEA software • Prepares Layout of fire fighting design for a given multistoried building plan using 4M-IDEA software
4	Preparation of Structural and Irrigation Drawings using CAD	• Draws R.C.C • Draws Structural Steel Drawings • Draws Irrigation Drawings	• Draws R.C.C • Draws Structural Steel Drawings • Draws Irrigation Drawings

COURSE CONTENT

1.0 Introduction to Project Management and Building Service soft wares.

a) Importance of Project Management software and Building Services Software.
b) Available Project Management soft wares – MS-project, Primavera Project Planner.
c) Features of MS-Project software.
d) Available Building services soft wares – 4M IDEA BIM (Building Information Modelling) software.
e) Features of 4M IDEA BIM (Building Information Modelling) software.

2.0 Practice on Project Management software.

a) Study various Menus available in MS-Project.
b) Identify various activities for a given project.
c) Input data required for the given project.
d) Prepare schedules using MS-Project for resources like men, material, machinery, money.
e) Calculate duration of project and Critical Path
f) Generate various reports for the supervision of the project.

3.0 Practice on Software for Building Services

a) Components of Building information Model (BIM) like 4M software.
   i. For Heat, Ventilation and Air conditioning design
   ii. For Water supply and sewage design
   iii. For Electrical design
   iv. For Design of lifts
   v. For design of Fire fighting System
   vi. For Gas supply pipes design
b) Prepare Layout of HVAC design for a given multistoried building plan.
c) Prepare Layout of water supply and sewerage design for a given multistoried building plan.
d) Prepare Layout of Electrical design for a given multistoried building plan.
e) Prepare Layout of Lift design for a given multistoried building plan.
f) Prepare Layout of fire fighting design for a given multistoried building plan.

4.0 Preparation of Structural and Irrigation Drawings using CAD

a) R.C.C Drawings - Singly reinforced Rectangular beam – T-beam – Slab – Column with Footing.
b) Structural Steel Drawings – Built-up beams – Beam-column connection – Slab base and Gusseted base.
c) Irrigation Drawings – Earthen Bunds – Slab Culvert – Pipe Culvert.

CIVIL ENGINEERING DRAWING – II

Subject Title : Civil Engineering Drawing - II
Subject Code : CE - 507
Periods/Week : 06
Periods/semester : 90

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Culverts	15	12	1	
2.	Bridges	15	12	1	01
3.	Public health engineering drawings	12	16	1	(25marks)
4.	Irrigation drawings	48	20	2	01 (15marks)
	Total	90	60	05	02

Note: All questions are to be answered. Part-A 5X4=20 marks & part-B 25+15=40 marks

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Draw different views of culverts

1.1 Draw the plan, cross sectional elevation and longitudinal sectional elevation of
1. Pipe culvert,
2. R.C.C slab culvert and

1.2 Identify the component parts of the pipe culvert and R C C slab culvert from the given set of specifications.

2.0. Draw different views of T. Beam bridge

2.1 Label the component parts of a given R.C.C. T-beam bridge.

2.2 Draw the sectional elevation, plan and cross section of Two span R.C.C T-beam bridge from the set of given specifications.

3.0 Draw the component parts of Public health Engineering works

3.1 Draw the sectional elevation, plan and cross section of public health Engineering works.

4.0 Draw the different views of irrigation Engineering structure

4.1 Draw the sectional elevation, plan and cross section of different Irrigation engineering structures.

COURSE CONTENT

1. Simple Culvert

Draw the plan, cross-sectional elevation and longitudinal sectional elevation of

1. Pipe culvert (Single Pipe)
2. R.C.C slab culvert with square returns.
3. R.C.C slab culvert with splayed wings

2. Bridges

1. Two-Span R.C.C T-beam bridge with square return walls.
2. Two-Span R.C.C T-beam bridge with splayed wing walls and Return walls.
3. Details of bearings used in steel bridges, R.C.C. bridges and P.S.C. bridges (sketches not to scale).

3. Public health engineering drawings

1. Septic tank with details of connection to a dispersion trench/soak pit
2. R.C.C overhead rectangular tank.(four columns with accessories).

4. Irrigation engineering drawings

1. Earthen bunds – Three types.

a) Homogeneous type b) Zoned embankment type c) Diaphragm type

2. Tank surplus weir with splayed wing walls.
3. Canal drop (notch type)
4. Head sluice (Head wall type)
5. Tank sluice with tower head.
6. Canal regulator

REFERENCE BOOKS

1. Civil Engineering Drawing-II by A. Kamala.
2. Civil Engineering Drawing-II by Chakraborthy

LIFE SKILLS

Subject Title : Life Skills
Subject Code : CE-508
Periods/ Week : 03
Periods/Semester : 45

TIME SCHEDULE

Sl No.	Major Topics	No. of periods		
		Theory	Practical	Total
1.	Concept of life skills	03	00	03
2.	Enhancing self esteem	01	02	03
3.	Goal setting	01	02	03
4.	Positive attitude	01	02	03
5.	Managing emotions	1 1/2	4 1/2	06
6.	Stress management	1 1/2	4 1/2	06
7.	Time management	1/2	2 1/2	03
8.	Interpersonal skills	01	02	03
9.	Creativity	01	02	03
10.	Problem solving and Decision making skills	01	02	03
11.	Assertiveness	1 1/2	4 1/2	06
12.	Leadership skills &Team spirit	1 1/2	11/2	03
TOTAL		15 1/2	29 1/2	45

Note: No Written Examination

The students may be asked to Demonstrate 1 or 2 skills from unit 2 to unit 12.
Marks: Internal – 40;
External - 60

OBJECTIVES

Upon the completion of the course the student shall be able to

1.0 Understand the concept of life skills
- 1.1 Define Life skills
- 1.2 Explain need and impact of Life skills programme
- 1.3 List the elements of Life skills
- 1.4 Identify the sources of Life skills

2.0 Understand the concept of Self esteem
- 2.1 Define the term self esteem
- 2.2 Explain the concept of self esteem

2.3 List the characteristics of High self esteem
2.4 List the characteristics of Low self esteem
2.5 Explain the advantages of High self esteem
2.6 Explain the behavior patterns of low self esteem
2.7 Explain the causes of Low self esteem
2.8 List the steps to build a positive self esteem

Practicals

Exp No	**Exercise**	**Activity (**Questionnaire / Game and Role play)
1.	Identifying the Behavior	• Identifying the behavior patterns of low self-esteem people.
2.	Practice Positive Self Esteem	• Steps to build a positive self esteem

3.0 Understand the concept of Goal setting

3.1 Define the term Goal
3.2 Explain the significance of Goal setting
3.3 Explain the following concepts
a) Wish b) Dream c) Goal
3.4 Explain the reasons for not setting goals
3.5 Explain the effective goal setting process
3.6 List the barriers to reach goals

Practicals

Exp No	**Exercise**	**Activity**
1	Differentiate among Wish, Dream and Goal	• Drawing a picture of Your Self/ Your Country/ Your Society after 10yrs. • Discussion: Setting Personal Goals • Story Telling • Identifying of barriers • Analysis of barriers • Overcoming Barriers

4.0 Practice positive attitude

4.1 Define Attitude
4.2 Explain the concept of positive attitude
4.3 Explain the concept of negative attitude
4.4 Explain the affects of negative attitude
4.4 Identify the attitude of self and peers
4.5 Explain the effect of peers on self and vice-versa.
4.6 List the steps to enhance positive attitude
4.7 Explain the strategies to enhance positive attitude

Practicals

Exp No	Exercise	**Activity** (Psychological Instrument/ Game & Role play**)**
1.	Identify Positive attitude	• To study & to identify the attitude of self and peers. • List & practice the strategies to enhance positive attitude.
2	Observe	• Positive attitudes of self and Peers • Negative attitudes of self and Peers
3	Practice Strategies to enhance Positive attitude	• Celebrating the success • Listing the successes

5.0 Practice managing emotions

5.1 Explain the concept of emotion
5.2 List the different types of emotions
5.3 Differentiate between positive and negative emotions
5.4 Identify the type of emotion
5.5 Explain the causes of different types of emotions.
5.6 Implement the methods to manage major emotions (anger / depression)
5.7 Define Emotional Intelligence.
5.8 Explain the method to enhance emotional Intelligence.

Practicals

Exp No	Exercise	**Activity** (Story / simulated situational act /GD & Role play)
1.	Identify the Type of Emotion	• To identify the type and to study the cause of the emotion.
2	Managing Emotions	• Managing major emotions -Anger and Depression

6.0 Practice stress management skills

6.1 Define Stress
6.2 Explain the concept of stress
6.3 List the Types of stress
6.4 Explain the causes of stress
6.5 Comprehend the reactions of stress
a) Physical b) Cognitive c) Emotional d) Behavioral
6.6 Explain the steps involved in coping with the stress by
a) Relaxation b) Meditation c) Yoga
6.7 Practice the stress relaxing techniques by the 3 methods.
a) Relaxation b) Meditation c) Yoga
6.8 Comprehend the changing personality and cognitive patterns.
6.9 Observe the changing personality and cognitive patterns.

Practicals

Exp No	Exercise	**Activity**(Questionnaire /Interview and practice)
1	Identify the type of stress	• To study & to identify the type and causes of stress.
2	Stress –Relaxation Techniques	• Practice some simple Stress –Relaxation Techniques, Meditation, Yoga.

7.0 Practice Time management skills

7.1 Define Time management.
7.2 Comprehend the significance of Time management.
7.3 Explain the strategies to set priorities.
7.4 List the steps to overcome barriers to effective Time management.
7.5 Identify the various Time stealers.
7.6 Explain the Time-Management skills.
7.7 List different Time-Management skills.
7.8 Comprehend the advantages of Time-Management skills.

Practicals

Exp No	Exercise	**Activity** (Group work and Games)
1	Identify Time stealers	• Assign a activity to different Groups – Observe the time of accomplishing the task, Identify the time stealers.
2.	Practice Time-Management skills	• Perform the given tasks- Games

8.0 Practice Interpersonal skills

8.1 Explain the significance of Interpersonal skills.
8.2 List the factors that prevent building and maintaining positive relationships.
8.3 Advantages of positive relationships.
8.4 Disadvantages of negative relationships

Practicals

Exp No	Exercise	Activity
1	Identify Relationships	• Positive Relationships, Negative Relationships – Factors that affect them- Through a story
2.	Practice Rapport building	• Exercises on Rapport building • Developing Correct Body Language

9.0 Understand Creativity skills

9.1 Define Creativity
9.2 List the synonyms like Invention , Innovatioin, Novelty
9.3 Distinguish between Creativity , Invention, innovation, and novelty
9.4 Discuss the factors that lead to creative thinking like observation and imitation , improvement etc.

9.5 Distinguish between Convergent thinking and divergent Thinking
9.6 Explain various steps involved in Scientific approach to creative thinking namely a) Idea generation b) Curiosity c) Imagination d)Elaboration e) Complexity
f). Abstract ion and simplification g). Divergent Thinking h) Fluency i). Flexibilty
j).Persistance k).Intrinsic Motivation l).Risk taking m).Projection/empathy n).Originality o). Story telling p). Flow.
List the Factors affecting the creativity in Individuals.
9.7 Give the concept of Vertical thinking and lateral thinking.
9.8 Explain the importance of Lateral thinking.
9.9 Compare lateral thinking and Vertical thinking

Practicals

Exp No	**Exercise**	**Activity** (Games and Group work)
1	Observe any given object	• Identifying finer details in an object
2.	Imagine	• Imagining a scene • Modifying a story (introduce a twist) • Improving a product • Finding different uses for a product
3	Skills	• Making paper craft
4	Product development	• Brain storming session
5	Developing originality	• Come up with original solutions for a given problem

10.0 Understand Problem solving and decision making skills

10.1 Define a Problem
10.2 Analyze the performance problems
10.3 Categorize the problems
10.4 List the barriers to the solutions to problems.

Practicals

Exp No	**Exercise**	**Activity** (Brainstorming – checklist technique free association, attribute listing)
1	Gather the facts and Data and Organizing the information.	• Information gathering and organizing • Identifying the solutions to the problem • Identifying the barriers to the solutions • Zeroing on Optimum solution
2.	Problem solving	• Games on Problem solving

11.0 Understand Assertive and non Assertive behavior

11.1 List the 3 types of Behaviors 1. Assertive 2. Non assertive (passive) 3. Aggressive behaviour 4.Submissive behaiviors
11.2 Discuss the personality of a person having above behaviours
11.3 Explain the usefulness of assertive behavior in practical situations.
11.4 Explain the role of effective communication in reflecting assertive attitude

11.5 Give examples of Assertive statements a) Assertive request b) assertive NO
11.6 Explain the importance of goal setting
11.7 Explain the method of Conflict resolution.
11.8 Discuss the methods of controlling fear and coping up with criticism.

Practicals

Exp No	**Exercise**	**Activity** (Simulated situational act)
1	Observation of behavior	• Identifying different personality traits from the body language
2.	Practicing assertiveness	• Write statements • Reaction of individuals in a tricky situation • Facing a Mock interview • Detailing the characteristics of peers • setting goals – Games like throwing a coin in a circle • Giving a feedback on a)Successful program b) Failed project • Self disclosure
3	Skills	• Dealing with a critic • Saying NO • Dealing with an aggressive person
4	Simulation	• Role play- skit 1. Assertive statements 2. goal setting 3. self disclosure

12.0 Practice Leadership skills
12.1 Explain the concept of leadership
12.2 List the Traits of effective leader
12.3 Distinguish between Managing and leading
12.4 List the 3 leadership styles
12.5 Compare the above styles of leadership styles
12.6 Discuss choice of leadership style
12.7 Explain the strategies to develop effective leadership.
12.8 Explain the importance of Decision making
12.9 Explain the procedure for making effective decisions.

Practicals

Exp No	**Exercise**	**Activity** (Games and Group work)
1	Observation	• Questionnaire
2.	Identification of a Leader	• Give a task and observe the leader • Discuss the qualities and his /her leadership style • Ask the other members to identify the leadership qualities

		• Reflection on the self
3	Skills	• Decision making – followed by discussion
4	Building Team spirit	• Motivation – Intrinsic and Extrinsic Training- Communication- Challenge

Competencies for Practical Exercises

S.No	Title	Competency	Key competencies
1.	Concept of life skills	• Explain need and impact of Life skills	
2.	Enhancing self esteem	• Follow the steps to build a positive self esteem	
3.	Goal setting	• Practice the effective goal setting process	
4.	Positive attitude	• Practice the steps to enhance positive attitude. • Observe the effects of peers on self and vice-versa.	Practice the steps to enhance positive attitude
5.	Managing emotions	• Practice the steps to manage emotional intelligence • Identify different types of emotions • Exercise control over Emotions	• Identify different types of emotions
6.	Stress management	• Practice stress management techniques	
7.	Time management	• Practice Time management techniques	
8.	Interpersonal skills	• Identify positive and Negative Relations	
9.	Creativity	• Lead a small group for accomplishment of a given task. • Build positive relationships.	• Build positive relationships.
10.	Problem solving and decision making skills	• Identify the various Problem solving and decision making skills • Make appropriate Decision	• Identify the various Problem solving and decision making skills
11.	Assertive and non Assertive behavior	• Practice Assertive and non Assertive behavior	
12.	Leadership skills	• Exhibit Leadership skills	• Exhibit Leadership skills

COURSE CONTENT

1.0 Concept of life skills

Definition of life skills, Need and impact of life skills programme

2.0 Enhancing self esteem

Concept, Characteristics of high and low self esteem people, Advantages of high self esteem, Causes of low esteem- Identification of behavior patterns of low self esteem – Practice session of Questionnaire / Game -Steps to build a positive self esteem – Practice session of Role play

3.0 Goal setting

Significance of goal setting, Concepts of Wish, Dream, and Goal Identify Wish, Dream, and Goal and differentiate among them Reasons for not setting the goals, Barriers to reach goals, Identify Barriers Effective goal setting process & Practice Effective goal setting

4.0 Positive attitude

Concept ,affects of negative attitude, attitude of self and peers, effect of peers on self and vice-versa, steps to enhance positive attitude, strategies to enhance positive attitude

5.0 Managing emotions

Problem-definition, performance problems ,Categorize the problems, barriers to the solutions to problems.

6.0 Stress management

concept of stress, Types of stress, causes of stress, reactions of stress, coping with the stress, stress relaxing techniques, changing personality and cognitive patterns

7.0 Time management

Definition, significance of various Time stealers, Time management, strategies to set priorities, steps to overcome barriers, Time-Management skills- its advantages.

8.0 Interpersonal skills

Significance of Interpersonal skills,positive relationships- Advantages, negative relationships- Disadvantages

9.0 Creativity

Definition, Invention, Innovation, Novelty,creative thinking , observation and imitation , improvement,Expertise ,skill, and motivation, components of Creativity ,Convergent thinking and divergent Thinking, various steps involved in Scientific approach to creative thinking namely , Factors affecting the creativity in Individuals, Vertical thinking and lateral thinking.

10.0 Problem solving and decision making skills

Definition, performance problems –analysis, categorizing,barriers to the solutions to problems.

11.0 Assertive and non Assertive behavior

Types of Behaviors – their characteristics, need for controlling and avoiding aggressive behaviors, making and refusing an assertive request – their evaluation, importance of goal setting, method of giving feed back.

12.0 Leadership skills

Concept , importance, Role of a Leader in an Organization, Traits of effective leader, Managing and leading, leadership styles-their Comparison, theories of leadership, strategies to develop effective leadership, importance of Decision making, concept of ethical leadership and moral development.

REFERENCEBOOKS

1.Robert NLussier, Christopher F. Achua Leadership: Theory, Application, & Skill development: Theory, Application.

FIELD PRACTICES

Subject Title : Field Practices
Subject Code : CE-509
Periods/Week : 07
Periods/Semester : 105

TIME SCHEDULE

S. No	Major Topics	No. of Periods
1.	Marking for the earth work of a pillar	07
2.	Marking for the earth work for the junction of two walls	07
3.	Marking the centre line of a one roomed building	07
4.	Marking for the earth work of a simple two roomed building	07
5.	Marking for the centre line of a one room in a residential building with reference to the given point using Total Station	07
6.	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	07
7.	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.	07
8.	Supervisory skills of Plastering of a wall.	07
9.	Supervisory skills for construction of Cement Concrete Flooring.	07
10.	Supervisory skills of fixing of floor trap, gully trap and their connections to drain.	07
11.	Placement of reinforcement in an Isolated Column Footing with proper cover.	07
12.	Positioning of shuttering to the column reinforcement	07
13.	Placement of reinforcement for sun shade (with specific attention of location).	07
14.	Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).	07
15.	Placement of reinforcement for slab (with specific attention of chairs). OR Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	07
	Total	105

SLILLS

After completion of the subject, the student shall be able to

1.0 Marking for the earth work of a pillar

1.1 Note down the measurements of pillar at superstructure and measurements of earth work excavation.
1.2 Mark the centre lines of pillar in either direction.
1.3 Mark the size of pillar with reference to the centre lines.
1.4 Mark the size by pouring the lime.

2.0 Marking for the earth work of a junction of a wall

2.1 Read the width of walls at super structure from drawing.
2.2 Mark the centre line of main walls from the markings on burjis.
2.3 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
2.4 Transfer the same by pouring the lime on the centre line.

3.0 Marking the centre line of a one roomed building

3.1 Read the width of walls at super structure and width of earth work excavation from drawing.
3.2 Mark the centre line of main wall from the markings on burjis.
3.3 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
3.4 Mark the width of walls with reference to centre lines of walls.
3.5 Transfer the same by pouring the lime to proceed for excavation.
3.6 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.
3.7 Transfer the same by pouring lime to proceed for excavation.

4.0 Marking for the earth work of a simple two roomed building

4.1 Prepare the centre line diagram from a given drawing.

4.2 Note down width of earthwork excavation.

4.3 Mark the centre lines on the ground with the help of plumb bob.

4.4 Check the accuracy by measuring length of two diagonals and their equality.

4.5 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.

4.6 Transfer the same by pouring lime to proceed for excavation.

5.0 Marking for the centre line of a one room in a residential building with reference to the given point using Total Station

5.1 Place the total station at the point of known co-ordinates.

5.2 Perform temporary adjustments.

5.3 Key in the known co-ordinates of the point.

5.4 Place the target prism on the ground to locate the first corner point of known/calculated co-ordinate of centre line of the room.

5.5 Transfer the first corner point on to the ground.

5.6 Repeat the procedure to locate the second, third, fourth corner points of known co-ordinates and transfer the poi nts on to the ground.

6.0 Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning

6.1 Note the mix proportion and take the respective quantities of cement and sand (volume of 1bag of cement = 0.035 cubic meter).

6.2 Place the measured quantity of sand to a suitable stack on an impervious hard surface.

6.3 Spread the cement uniformly over the sand stack.

6.4 Dry mix both sand and cement thoroughly to a uniform colour.

6.5 Sprinkle sufficient quantity of water on the dry mix while thoroughly mixing the dry mortar, which can be used for 30 minutes.

6.6 Continue the mixing to bring the mortar to a stiff paste of working consistency.

7.0 Construction of 230mm thick brick wall in English Bond at the corner of a wall and check for horizontality and verticality

7.1 Soak the bricks in water and air dry before their use.
7.2 Prepare C.M of specified proportion and keep ready for use
7.3 Sketch the two threads perpendicular to each other at specified corner in line with the outer edges of wall.
7.4 Arrange the quion header in line with the two perpendicular threads
7.5 Arrange the queen closure adjacent to quoin header.
7.6 Continue one layer with headers on one face and stretchers on the perpendicular face to the true line.
7.7 Continue the next layer with stretchers on headers and headers on stretchers.
7.8 Check the verticality of the wall with the help of plumb bob and horizontality with the help of level tube for every three to four layers.
7.9 Place the bricks, with frog at the top.
7.10 Fill the vertical joint in each layer with mortar using trowel.

8.0 Supervisory skills of Plastering of a wall

8.1 Prepare the surface by raking the joints and brushing the efflorescence if any by brushing and scraping dust and loose mortar.
8.2 Remove efflorescence if any by brushing and scraping.
8.3 Wash the surface thoroughly with water and keep the surface wet before commencement of plastering.
8.4 Complete the ceiling plaster before commencement of wall plaster
8.5 Fill all put log holes in advance of the plastering.
8.6 Start plastering from top and work down towards the floor.
8.7 Apply 15cm x 15cm plaster of specified thickness first, horizontally and vertically at not more than 2.0m intervals over the entire surface to serve as gauges.

8.8 Check the surfaces of gauges for truly in plane of the finished plaster surface by using a plumb bob.
8.9 Apply the mortar on the wall between the gauges with a trowel to a thickness slightly more than the specific thickness.
8.10 Use a wooden straight edge to bring to the true surface with small upward and sideways movement at a time reaching across the gauges.
8.11 Use trowel to obtain final finish surface as a smooth OR wooden float for sandy granular texture.
8.12 Avoid excessive use of trowel or over working the float.

9.0 Supervisory skills for construction of Cement Concrete Flooring

a. Base Concrete

9.1 Use cement concrete of specified mix
9.2 Provide base concrete with the slopes towards floor trap required for the flooring using tube level.
9.3 Provide a slope ranging from 1:48 to 1:60 for flooring in varandah, courtyard, kitchen and bath.
9.4 Provide a slope of 1:30 for floors in water closet portion.
9.5 Provide necessary drop of 6mm to 10mm in flooring in bath, water closet and kitchen near floor traps to avoid spread of water.

b. Finishing

9.6 Follow the finishing of the surface immediately after the cessation of beating.
9.7 Allow the surface till moisture disappears from it.
9.8 Use of dry cement or cement mortar to absorb excessive moisture not permitted.
9.9 Spread the thick slurry of fresh cement and water @ 2kg of cement over an area of 1 square metre of flooring, while flooring concrete is still green.
9.10 The cement slurry shall be properly processed and finished smooth.
9.11 Finish the edge of sunk floor rounded with C.M 1:2 and finish with a floating coat of neat cement.
9.12 Cure the surface for a minimum period of 10 days.
9.13 Lay the flooring in lavatories and bath rooms only after fixing of water closets and squatting pans and floor traps.
9.14 Plug the traps while laying and open after curing and cleaning.

10.0 Supervisory skills of fixing of floor trap, gully trap and their connections to drain.

10.1 Identify the Floor trap and Gully trap
10.2 Identify the location of fixing the floor trap and gully trap
10.3 Connect the floor trap to the drain pipe.
10.4 Fix the joint using proper filler and adhesive material such that the joint is water tight.
10.5 Fix gully trap on cement concrete foundation 65 mm x 65 mm and not less than 10 mm thick.
10.6 Prepare a mix of concrete 1:5:10 and jointing of gully outlet gully outlet to the branch drain is done
10.7 Tarred gasket soaked in thick cement slurry shall first be placed round the spigot of the drain

10.8 The remainder of the socket is filled with stiff mixture of cement mortar in the proportion of 1:1.

11.0 Placement of reinforcement for an Isolated Column Footing

11.1 The grill of column footing should be kept ready as per design data.
11.2 Mark the centre lines in both directions on levelling course / bedding concrete with the help of plumb bob from the string stretched over the burjis.
11.3 Mark centre of the outer reinforcing rods of footing in either direction.
11.4 Carefully place the grill such that centre line markings of outermost reinforcing rods are exactly above the centre lines marked on the bedding concrete.
11.5 Place the chairs/cover blocks of specified thickness below the bottom layer of reinforcing rods.
11.6 Exercise care for rectangular column footing while placing reinforcing mat such that bars in longer direction are at bottom.

12.0 Positioning of shuttering to the column reinforcement

12.1 Place the column reinforcement with chairs or cover blocks over the foundation mat.
12.2 Prepare the reinforcement as per the drawing.
12.3 Check for the verticality of column reinforcement with plumb bob
12.4 Provide lateral support for the column reinforcement to keep them in position.
12.5 Prepare the shuttering and apply waste oil inside surfsce of the shuttering box and fastenings
12.6 Place the shuttering box around the column and fix the fastenings.
12.7 Check for the verticality of shuttering with plumb bob

13.0 Placement of reinforcement for sun shade (with specific attention of location)

13.1 Prepare the reinforcement as per design
13.2 Prepare the centering for sun shade
13.3 Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover
13.4 Place the cement mortar cover blocks or chairs of specified height below the main reinforcement to have prescribed cover above the reinforcement
13.5 Observe for sufficient length of anchorage of main reinforcement into the lintel or the beam etc.

14.0 Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs)

14.1 Read the reinforcement details from the bar bending schedule
14.2 Prepare the shuttering for the stairs as per the design.
14.3 Bend the reinforcing bars to the shape and length confirming to the bar bending schedule.
14.4 Place the bars at the specified spacing maintaining the cover with the help of chairs or cover blocks.
14.5 Exercise care in the placement of reinforcement of at the junction of waist and loading slab.
14.6 Tie the distributors parallel to raisers at the specified spacing

15.0 Placement of reinforcement for slab (with specific attention of chairs)

15.1 Prepare the reinforcement as per design
15.2 Rest the reinforcement in slabs on bar chairs
15.3 Securely fix to the bar chairs so that it won't move when concrete is placed around it.
15.4 Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete.
15.5 Anchor the reinforcement to improve the transfer of tensile forces to the steel by bending or hooking or lapping the bars.

16.0 Placement of reinforcement for a beam column junction (with specific attention to Earth quake resistance design)

16.1 Read the reinforcement details from the bar bending schedule
16.2 Note down proper cover-clear cover, nominal cover or effective cover to reinforcement.
16.3 Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings..
16.5 . Show enlarged details at corners, intersection of beams and column junction
16.6 Avoid congestion of bars at points where members intersect and make certain that all reinforcement is properly placed.
16.7 In the case of bundled bars, Make lapped splice of bundled bars by splicing one bar at a time
16.7 Stagger such individual splices within the bundle.
16.8 Make sure that hooked and bent up bars can be placed and have adequate concrete protection.

Key competencies to be achieved by the student

S.No	Experiment title	Key competency
1	Marking for the earth work of a pillar	Mark the size of pillar with reference to the centre lines
2	Marking for the earth work for the junction of two walls	Mark the centre line of main walls from the markings on burjis
3	Marking the centre line of a one roomed building	Mark the centre line of cross wall perpendicular to main wall
4	Marking for the earth work of a simple two roomed building	Check the accuracy by measuring length of two diagonals and their equality.
5	Marking for the centre line of a one room in a residential building with reference to the given point using Total Station	Transfer the first corner point on to the ground.
6	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	Dry mix both sand and cement thoroughly to a uniform colour
7	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and	Arrange the quoin header in line with the two perpendicular

	check for horizontality and verticality.	threads
8	Supervisory skills of Plastering of a wall.	Complete the ceiling plaster before commencement of wall plaster
9	Supervisory skills for construction of Cement Concrete Flooring.	The cement slurry shall be properly processed and finished smooth
10	Supervisory skills of fixing of floor trap, gully trap and their connections to drain.	Fix the joint using proper filler and adhesive material such that the joint is water tight.
11	Placement of reinforcement in an Isolated Column Footing with proper cover.	Mark centre of the outer reinforcing rods of footing in either direction.
12	Positioning of shuttering to the column reinforcement	Place the shuttering box around the column and fix the fastenings
13	Placement of reinforcement for sun shade (with specific attention of location).	Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover
14	Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).	Exercise care in the placement of reinforcement of at the junction of waist and loading slab.
15	Placement of reinforcement for slab (with specific attention of chairs).	Locate reinforcing bars and mesh so that there is enough ro between the bars to place and compact the concrete.
16	Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings..

COURSE CONTENT

1. Marking for the earth work of a pillar.
2. Marking for the earth work for the junction of two walls.
3. Marking the centre line of a one roomed building
4. Marking for the earth work of a simple two roomed building.
5. Marking for the centre line of a one room in a residential building with

reference to the given point using Total Station.

6. Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.
7. Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.
8. Supervisory skills of Plastering of a wall.
9. Supervisory skills for construction of Cement Concrete Flooring.
10. Supervisory skills of fixing of floor trap, gully trap and their connections to drain.
11. Placement of reinforcement in an Isolated Column Footing with proper cover.
12. Positioning of shuttering to the column reinforcement.
13. Placement of reinforcement for sun shade (with specific attention of location).
14. Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).
15. Placement of reinforcement for slab (with specific attention of chairs).
16. Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).

REFERENCE

1. CPWD SPECIFIATIONS, Govt of India Vol I&II, 2009
2. Practical Civil engineering hand book – Kale and Shaw
3. Building Construction – Bindra & Arora
4. National Building Code- BIS publication

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI Semester

TIME SCHEDULE

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE- 601	Steel Structures	5	-	75	3			100
CE -602	Environmental Engineering - II	4	-	60	3			100
CE -603	Construction Technology & Valuation	5	-	75	3			100
CE -604	Construction Failures & Repairs	5	-	75	3			100
CE -605	Quality Control & Safety in Construction	4	-	60	3			100
PRACTICAL:								
CE- 606	Civil Engineering Workshop	-	3	45	3			100
CE -607	S.E. Drawing	-	6	90	3			100
CE -608	Construction Technology Practice	-	3	45	3			100
CE -609	Project Work	-	7	105	3			100
TOTAL		23	19	630				900

DESIGN OF STEEL STRUCTURES

Subject Title : DESIGN OF STEEL STRUCTURES
Subject Code : CE-601
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S.No	Major **Topics**	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Introduction and Fundamentals of Limit State Design of Steel structures	02	03	01	-
2.	Design of fillet welded joints	06	13	01	01
3.	Design of Tension members	09	16	02	01
4.	Design of Compression members, Columns &Column bases	20	36	02	03
5.	Design of Beams	15	26	02	02
6.	Design of Roof trusses	08	16	02	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Know the Introduction and fundamentals of limit state design of steel structures

1.1 State common types of steel structures.
1.2 State the merits and demerits of Steel Structures.
1.3 State the demerits of Steel Structures
1.4 List the loads considered in the design of steel structures as per I.S:875-1987.
1.5 Describe various types of loads to be considered in the design of steel structures.
1.6 Understand the code of practice I.S. 800-2007
1.7 List physical properties of structural steel.
1.8 List mechanical properties of structural steel
1.9 Sketch different types of rolled steel sections
1.10 Classify cross sections of class 1 to 4
1.11 List types of elements.
1.12 Explain the Concept of Limit State Design.
1.13 Define ‘limit state’.
1.14 State types of limit states.
1.15 Define the following terms:
1. Characteristic action,
2. Design action and
3. Design strength.

1.16 State the partial safety factor values for loads in limit state of strength and serviceability.
1.16 State the partial safety factor values for materials in limit state.
1.17 State the deflection limits for
1. Simply supported beam,
2. Cantilever beam and
3. Purlins

2.0 Understand the principles of design of Fillet Welded Joints

2.1 State different types of joints.
2.2 Differentiate the welded joints and Riveted joints
2.3 Sketch the different forms of welded joints.
2.4 Explain the features of a fillet welded joint.
2.5 State stresses in welds as per I.S.800-2007.
2.6 State formula for design strength of a fillet welded joint.
2.7 Calculate the design strength of a fillet welded joint.
2.8 Design a fillet welded joint for a given load, thickness of a plate and permissible stresses as per code.
2.9 Design a fillet welded joint for a single angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.
2.10 Design a fillet welded joint for a double angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.

2.0 **Understand the principles of design of Tension Members**

3.1 Define ' tie'
3.2 State the applications of tension members.
3.3 Sketch different forms of tension members.
3.4 Understand the behaviour of tension members.
3.5 State the different modes of failures
3.6 Describe different modes of failures of tension members with sketches
3.7 State the maximum values of effective slenderness ratios as per code.
3.8 Determine the net effective area of single angle connected to gusset plate by welding.
3.9 Determine the design strength due to yielding of gross section, rupture of critical section and block shear failure of a single angle connected by welding
3.10 Understand design procedure of tension members.
3.11 Design a single angle tension member connected by welding only.

4.0 Understand the principles of design of Compression Members, Columns and Column bases

4.1 Understand the compression members
4.2 State different types of compression members (like column,strut)
4.3 Sketch different forms of compression members.
4.4 Understand the behaviour of compression members –
4.5 Classify cross sections.
4.6 Distinguish between actual length and effective length.
4.7 Define the terms 1. Least radius of gyration and 2. Slenderness ratio.
4.8 State effective lengths to be used for different end conditions.
4.9 Understand buckling class of cross section like 1. Imperfection factor and

2. Stress reduction factor for different buckling classes – column buckling curves.

4.10 State maximum values of effective slenderness ratios as per code

4.11 Understand the design compressive stress for different column buckling classes.

4.12 Determine the design strength of compression members

4.13 Understand design procedure of compression members.

4.14 Design columns with I sections and built up channel sections.

4.15 Understand design details - effective sectional area – codal provisions for angle struts.

4.16 Design single angle and double angle struts.

4.17 Understand codal provisions of single / double lacing and battening for built-up columns.

4.18 Design a slab base along with a cement concrete pedestal also design the welded connection.

5.0 Understand the principles of design of Steel Beams

5.1 Understand the concept of limit state design of beams

5.2 Define the terms:
1. Elastic moment of resistance,
2. Plastic moment of resistance,
3. Elastic section modulus,
4. Elastic section modulus and
5. Shape factor.

5.3 Determine the shape factor values for rectangular, T, I section

5.4 Understand the behaviour of steel beams.

5.5 Classify beams based on lateral restraint of compression flange.

5.6 Determine the design strength in bending (flexure) and in shear.

5.7 List the factors affecting lateral stability – influence of type of loading.

5.8 Distinguish between web buckling and web crippling.

5.9 Understand the beams failure by flexural yielding – types.

5.10 List the types of beams failure by flexural yielding

5.11 Understand laterally supported beam – holes in tension zone – shear lag effects – design bending strength.

5.12 Understand laterally unsupported beam – lateral torsional buckling of beams (theoretical concept only – no problems).

5.13 Explain effective length of compression flanges.

5.14 Understand concept of shear in beams – resistance to shear buckling.

5.15 Understand shear buckling design methods like 1. Simple post critical method and 2. Tension field method.

5.16 Understand the design of simple beams with solid webs.

5.17 Understand component parts of plate girders with sketches

5.18 Describe different types of Stiffeners with their suitability.

5.19 Design laterally supported simply supported beam considering all codal requirements.

6.0 Understand the principles of design of Roof Trusses

6.1 List types of trusses – 1. Plane trusses and 2.Space trusses.

6.2 Understand the situations where roof trusses are used.

6.3 Sketch different types of roof trusses with their suitability for a given span.

6.4 Sketch a roof truss and name the component parts.
6.5 Understand the configuration of trusses like1. Pitched roof and 2. Parallel chord trapezoidal trusses.
6.6 Understand cross sections of truss members.
6.7 Understand the loads on roof trusses as per I.S – 875.
6.8 Explain the method of calculating the wind load on roof trusses..
6.9 Determine loads at nodal points of a given roof truss due to dead load, live load and wind load , given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and internal pressure coefficients.

COURSE CONTENT

1.0 Introduction and fundamentals of limit state design of steel structures

1.1 Merits and demerits of steel structures.
1.2 Loads considered in the design of steel structures as per I.S:875 -1987.
1.3 Introduction to I.S. 800-2007 - Mechanical properties of structural steel – yield stress (fy), ultimate tensile stress (fu) and maximum percent elongation (table -1 of IS:800-2007)
1.4 Standard structural sections – Classification of cross sections – class 1(plastic) class2(compact) class3(semi compact) and class4(slender) – types of elements –internal elements, outstands and tapered elements.
1.5 Concept of Limit State Design – limit state of strength – limit state of serviceability – classification of actions – strength – partial safety factors for loads and materials – deflection limits.

2.0 Design of Fillet Welded Joints

2.1 Different types of joints – lap joints – butt joints.
2.2 Differentiation of welded joints and riveted joints.
2.3 Different forms of welded joints – sketches of fillet and butt weld joints.
2.4 Fillet welded joint – detailed sketch showing the component parts.
2.5 Stresses in welds as per I.S.800-2007 – Codal requirements of welds and welding.
2.6 Problems on calculation of strength of a fillet welded joint.
2.7 Design of fillet welded joint for a given load, thickness of a plate and permissible stresses as per code.
2.8 Design of fillet welded joint for single or double angles carrying axial loads.

3.0 Design of Tension Members

3.1 Introduction to tension members and different forms of tension members.
3.2 Behaviour of tension members.
3.3 Different modes of failures – gross section yielding, net Section rupture and block shear failure.
3.4 Maximum values of effective slenderness ratios as per code.
3.5 Calculation of net effective sectional area of single angle with welded connection only.
3.6 Calculation of the design strength due to yielding of gross section, rupture of critical section and block shear – problems on single angle with welded connection only.
3.7 Design procedure of tension members.

3.8 Problems on design of tension members single angle with welded connection only.

4.0 Analysis and design of Compression Members, columns and column Basis

4.1 Introduction to compression members - different forms of compression members.
4.2 Behaviour of compression members – classification of cross sections - Classification of cross sections – class 1 (plastic) class2 (compact) class3 (semi compact) and class4 (slender).
4.3 Effective lengths to be used for different end conditions – table 11 of I.S:800.
4.4 Buckling class of cross section – imperfection factor and stress reduction factor for different buckling classes – column buckling curves.
4.5 Maximum values of effective slenderness ratios as per code – design compressive stress for different column buckling classes.
4.6 Calculation of design strength of compression members – problems.
4.7 Design procedure of compression members – problems on simple sections only (no builtup sections).
4.8 Design details - effective sectional area – codal provisions for angle struts – single angle and double angle – discontinuous and continuous struts.
4.9 Codal provisions of single / double lacing and battening for built-up columns (no problems).
4.10 Design of slab base along with a cement concrete pedestal, design of welded connection of base plate and column – problems.

5.0 Analysis and design of Steel Beams

5.1 Concept of limit state design of beams – shape factor and plastic properties of beams – Problems on shape factor.
5.2 Behaviour of steel beams – design strength of in bending (flexure).
5.3 Factors affecting lateral stability – influence of type of loading-web buckling and web crippling.
5.4 Beams failure by flexural yielding – types.
5.5 Laterally supported beam – holes in tension zone – shear lag effects -– design bending strength
5.6 Laterally unsupported beam – lateral tensional buckling of beams - (theoretical concept only – no problems).
5.7 Effective length of compression flanges.
5.8 Concept of shear in beams – resistance to shear buckling.
5.9 Shear buckling design methods - simple post critical method – tension field method.
5.10 Design of laterally supported simple beams with solid webs.
5.11 Component parts of plate girders with sketches – brief description of different types of stiffeners.
5.12 Design of laterally supported simply supported beam considering all codal requirements.

6.0 Design of Roof Trusses

6.1 Types of trusses – plane trusses, space trusses.
6.2 Sketches of different roof trusses with their suitability for a given span.
6.3 Cross sections of truss members.
6.4 Loads on roof trusses as per I.S – 875.

6.5 Determination of loads at nodal points of a given roof truss due to dead load, live load and wind load, given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and I nternal pressure coefficients.– problems.

REFERENCE BOOKS

1. Code of practice: IS 800-2007
2. Limit state Design of Steel Structures by S.K. Duggal/TMH
3. Structural steel design by M.L.Gambhir/TMH
4. Design of Steel Structures by N.Subramanian
5. Design of Steel Structures by S.S.Bhavikatti
6. Structural Engineering by A.P.ArulManickam
7. Teaching Resource Material : http://www.steel-insdag.org
8. Teaching Resource Material : http://www.nptel.iitm.ac.in

ENVIRONMENTAL ENGINEERING – II

Subject Title : Environmental Engineering - II
Subject Code : C-602
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to Sanitary Engg & Quantity of Sewage	08	16	02	01
2	Laying of Sewers & Sewers appurtenances	08	19	03	01
3	Characteristics of Sewage, treatment & disposal	17	26	02	02
4	Solid waste disposal and Sanitation in buildings	12	23	01	02
5	Rural Water Supply and Sanitation	06	13	01	01
6	Air Pollution	05	13	01	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the basics of sanitary engineering and Quantity of sewage

1.1 State the objectives of sewage disposal works.
1.2 Define the terms:
1. Sewage,
2. Sewer and
3. Sullage.
1.3 Explain the the following:
1. Sewerage,
2. Refuse and
3. Garbage
1.4 List the objectives of sewerage works.
1.5 List the various methods of sewage collection works.
1.6 Compare conservancy system with water carriage system.
1.7 Explain the different sewerage systems.
1.8 Compare the systems of sewerage with each other.
1.9 Know which system of sewerage is preferable for towns with small and evenly distributed rainfall.
1.10 Understand which system of sewerage is used for a city like Hyderabad. Justify the choice.
1.11 State the main constituents of sewage for calculating quantity.
1.12 Define Dry weather flow.
1.13 State the factors affecting dry weather flow.
1.14 State the factors affecting the quantity of storm sewage.

1.15 Explain the variation in rate of sewage.
1.16 Estimate the quantity of storm water flow using 1. Rational method and 2. Empirical formulae.
1.17 List the requirements of good surface drains.
1.18 Describe different types of surface drains with their merits and demerits.
1.19 State the limiting velocities of flow in sewers.
1.20 Works out simple problems on design of sewers running half full only.
1.21 Explain the use of nomograms in detail in the design of sewers.

2.0 Understand the Types of sewers, laying of sewers and appurtenances

2.1 State various shapes of sewers.
2.2 Explain the circular sewer with a sketch
2.3 list any two merits and demerits OF circular sewer
2.4 Mention different materials used for sewers.
2.5 State any two merits and demerits for each type of sewer.
2.6 Explain the method of laying the sewers as per given alignment.
2.6 Know, why is it necessary to provide sewer appurtenances on the sewer lines.
2.7 List the various sewer appurtenances on a sewer line.
2.8 Explain the necessity of providing manhole in sewer line with the help of sketch.
2.9 Explain the construction, function and location of the different sewer appurtenances.
2.10 Know ,why is it necessary to ventilate the sewers and how is it done.
2.11 State the situations under which sewage pumping is necessary.
2.12 Explain the component parts of a pumping station and factors influencing its location.
2.13 Explain the construction and working of Shone's ejector with the help f a sketch.
2.14 Know ,how the testing of sewers is done.
2.15 Understand ,why explosions occur in sewer lines and how they can be prevented.

3.0 Understand the characteristics of sewage

3.1 Define strength of sewage.
3.2 Describe the method of sampling sewage.
3.3 State the physical, chemical and biological characteristics of sewage.
3.4 Define C.O.D and B.O.D
3.5 State the significance of the following tests to Analyse sewage.
i) Solids (ii) C.O.D. (iii) B.O.D. (iv) PH-Value (v) Chlorides.
3.6 State the characteristics of industrial waste water.
3.7 Explain the principles of treatment of industrial wastewater.
3.8 State the objects of sewage treatment.
3.9 Draw the conventional sewage treatment plant of a town and indicate the main function of each unit.
3.10 State the function of screens, skimming tanks and grit chambers.
3.11 Explain briefly the working of screens, grit chambers, skimming tanks.
3.12 Describes with sketch wherever necessary the following treatment works.
a) sedimentation tank.
b) Trickling filters.

c) Activated sludge process.
d) Oxidation ditch.
e) Oxidation pond.
f) Aerated lagoons.
g) Anaerobic lagoons.
h) Sludge digesters

3.13 Compare activated sludge process and trickling filters.
3.14 List out various methods of sludge disposal.
3.15 Explain the methods of sludge disposal.
3.16 Explain with sketch the treatment of sewage by septic tank and soak pit.
3.17 Determine the dimensions of a sedimentation tank and a septic tank for given data.
3.18 List the various methods of sewage disposal.
3.19 Explain the methods of disposal of sewage.

4.0 Know the methods of disposal of solid wastes and Sanitation in Building

4.1 Define the term' Refuse'
4.2 State the classification of solid wastes.
4.3 Explain the methods of disposal of solid wastes.
4.4 State any two merits and two demerits for each of the solid waste disposal methods.
4.5 Know, what is meant by composting.
4.6 Explain the methods of composting.
4.7 List the equipments required for preparation of compost by mechanical composting.
4.8 State the aims of building drainage .
4.9 State the requirements of good drainage system in buildings.
4.10 Know about the terms: soil pipe, waste pipe, vent pipe, anti- syphonage pipe.
4.11 Describe the layout of sanitary fittings and house drainage arrangements for buildings (single and multi-storied).
4.12 Explain with sketches the different types of plumbing systems.
4.13 Describe different sanitary fittings like water closets, flushing cisterns, urinals, inspection chambers, traps, anti-siphonage pipes.
4.14 Explain the procedures involved in the inspection, testing and maintenance of sanitary fittings.

5.0 Knows the methods of rural sanitation

5.1 Explain the process of disinfection of wells by two pot method.
5.2 List the different types of sanitary latrines.
5.3 Explain the methods of rural sanitation.
5.4 Describe with sketches the construction of sanitary latrines in rural areas.
5.5 State the advantages of bio-gas plant.
5.6 State the factors on which the production of bio-gas depends.
5.7 Describe the construction and working of K.V.I.C.model bio-gas plant with a neat sketch.
5.7 Describe the construction and working of Janata model bio-gas plant with a sketch.
5.9 Know about vermi composting.
5.10 Describe briefly the procedure of vermi composting and mention its advantages.

6.0 Know the effects of air pollution and its control

6.1 Define the term air pollution.
6.2 State the sources of air pollution.
6.3 Explain the natural and manmade sources of air pollution.
6.4 List the effects of air pollution.
6.5 Explain the effects of air pollution on human health and vegetation.
6.6 Explain the effects of air pollution on atmosphere and materials.
6.7 List the methods of control of air pollution.
6.8 Explain the method of prevention of air pollution at source.
6.9 List the various types of controlling devices and equipment.
6.10 Explain briefly with sketches the methods of controlling air pollution by controlling devices and equipment.
6.11 Describe briefly the control of air pollution by stacks.
6.12 Explain the method of prevention of air pollution by vegetation.

COURSE CONTENT

1. Introduction and Quantity of Sewage

a) Object of providing sewerage works.
b) Definition of terms : sullage, sewage, sewer and sewerage – classification of sewage.
c) System of sewage disposal - conservancy and water carriage systems.
d) Types of sewerage systems and their suitability – separate, combined and partially separate systems.
e) Quantity of discharge in sewers, dry weather flow, variability of flow.
f) Determination of storm water flow – run off co-efficient, time of concentration, rational method and empirical formulae for run-off.
g) Surface drainage - requirements, shapes, laying and construction.
h) Simple problems on design of sewers (running half full only) using Manning's and Hazen Williams formulae .
i) Use of nomograms as per I.S.1742 to determine the unknown values of gradient, diameter, discharge and velocity.

2. Laying of Sewers and Sewer Appurtenances

a) Different shapes of cross section for sewers – circular and non-circular – merits and demerits of each.
b) Brief description and choice of types of sewers - stone ware, cast iron, cement concrete sewers and A.C Pipes.
c) Laying of sewers - setting out alignment of a sewer, excavation, checking the gradient , preparation of bedding, handling, lowering, laying and jointing, testing and back filling.
d) Brief description, location, function and construction of
   i) Manholes.
   ii) Drop manholes.
   iii) Street inlets.
   iv) Catch basins.
   v) Flushing tanks.
   vi) Regulators.
   vii) Inverted siphon.

e) Necessity of pumping sewage - location and component parts of a pumping station.

3. Sewage Characteristics

a) Strength of sewage, sampling of sewage, characteristics of sewage; physical, chemical and biological.
b) Analysis of sewage - significance of the following tests for (No details of tests)
(i) Solids, (ii) C.O.D, (iii) B.O.D., (iv) P**H** - Value, (v) Chlorides.
c) Characteristics of Industrial waste water–principles of treatment, Reduction of volume and strength of wastewater, Equalization, Neutralization and proportioning.
d) Preliminary treatment - Brief description and functions of following units.
(i) Screens, (ii) Skimming tanks and (iii) Grit chambers.
e) Primary treatment - Brief description and functions of Plain sedimentation, simple problems on the design of sedimentation tanks.
f) Secondary treatment - Brief description of
(i) Trickling filters (ii) Activated sludge process (iii) Oxidation ditc
(iv) Oxidation pond (v) Aerated lagoons (vii) Anaerobic lagoons
g) Sludge digestion – Process and methods of sludge disposal.
h) Miscellaneous treatments-septic tank.
i) Sewage disposal - dilution, disposal on to lands, ground water recharge, reuse etc.

4. Solid Waste Disposal and Sanitation in Buildings

a) Methods of disposal - uncontrolled dumping, tipping or sanitary land fill – Incineration - composting.
b) Preparation of compost - equipments required such as storage hoppers, grinders conveyors etc., in mechanical composting.
c) Aims of building drainage and its requirements – General layout of sanitaryfittings to a house - drainage arrangements for single and multi storeyed buildings as per IS code of practice-plumbing systems.
d) Sanitary fittings – traps, water closets, flushing cisterns, urinals, inspection chambers, anti siphonage - Inspection, testing and maintenance of sanitary fittings.

5. Rural Water Supply and Sanitation

a) Disinfection of wells.
b) Rural sanitation and sanitary latrines, biogas production technology -brief description and operational details of bio-gas plants using animal waste, night soil and agricultural wastes -KVIC and JANATA models- merits and demerits-maintenance of biogas plant.
c) Vermi composting –procedure -advantages

6. Air Pollution

a) Definition - sources of air pollution – effects of population.
b) Control of air pollution – methods - air pollution control at source – zoning – installation of controlling devices and equipment : internal separators, gravity settling chambers, cyclones, fabric filters, wet collection devices : cyclonic

scrubbers, venture scrubbers, electrostatic precipitators - brief description of the above equipment – air pollution control by stacks – by vegetation.

REFERENCE BOOKS

1. Environmental Engineering – G.S. Birdie
2. Elements of Public Health engineering – K.N. Duggal
3. Environmental Engineering – Baljeet Kapoor
4. Public Health Engineering – S.K. Hussain
5. Environmental Engineering – Ramachandraiah
6. Water supply and sanitary Engineering – V.N. Vazirani.
7. Environmental Engineering --N.N.Basak/TMH

CONSTRUCTION TECHNOLOGY AND VALUATION

Subject Title : Construction Technology and Valuation
Subject Code : CE-603
Periods per Week : 05
Periods per Semester : 75

TIME SCHEDULE

S No	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Type
1.	Concrete Technology	20	29	3	2
2.	Pre stressed Concrete	10	13	1	1
3.	Form Work and Reinforcement	08	13	1	1
4.	Construction Machinery and Equipment	08	13	1	1
5.	Building Services	09	13	1	1
6.	Earth quake resistant Structures	06	13	1	1
7.	Building Valuation	14	16	2	1
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concrete Technology

1.1 State the ingredients of Concrete.
1.2 Define 1. Workability and 2. Water/Cement ratio
1.3 Explain the relation between strength of concrete , workability and water/cement ratio
1.4 Understand ‘Grades’ of concrete.
1.5 State the grades of concrete recommended for different types of works.
1.6 Differentiate ‘Normal strength concrete and High strength concrete’
1.7 Differentiate between ‘Ordinary Concrete and Controlled Concrete’
1.8 State the functions of Admixtures in concrete
1.9 List out different admixtures being used.
1.10 State the Principles of Concrete Mix Design.

1.11 State the factors affecting variability of concrete strength.
1.12 Explain the procedure of Concrete Mix design using IS Code method
1.13 Understand the following special concretes
1. Fiber Reinforced Concrete,
2. Fal-G-Concrete,
3. Light weight concrete,
4. High density concrete,
5. Polymer concrete and
6. Self compacting concrete
1.14 Understand concreting under special exposure conditions like
1. Under- water concreting,
2. Cold weather concreting,
3. Hot weather concreting and
4. Concreting in high rise buildings
1.15 Explain 'Micro concrete' and 'Shotcrete'.
1.16 State the need for Expansion and Construction joints in concrete structures.
1.17 Explain the method of providing various joints in RCC roofs.

2.0 Understand the Pre stressed concrete

2.1 Understand fundamental principles of prestressed concrete.
2.2 State the materials and permissible stresses.
2.3 List the losses of prestress.
2.4 Explain the methods of 1. Pre stressing and 2. Post- tensioning systems.

3.0 Understand Form work and Reinforcement

3.1 State the Objectives of Formwork.
3.2 State the requirements of formwork.
3.3 List the loads to be considered for the design of formwork.
3.4 Draw the formwork arrangements for
1. Slab and Beam system,
2. Column and
3. Wall
3.5 State the merits of Steel formwork over Timber formwork.
3.6 State the demerits of Steel formwork over Timber formwork.
3.7 State the chemical composition of structural steel as per IS.
3.8 State different types of steels used for concrete reinforcement along with their mechanical properties.
3.9 Explain the bond mechanism in plain and deformed bars.

4.0 Understand the Construction Machinery and Equipment

4.1 Understand the need for mechanization and construction activities
4.2 State different types of construction equipment
4.3 Explain the uses of different construction equipment
4.4 State the factors to be considered for the selection of type of construction equipment.

5.0 Understand the Buildings services

5.1 Explain the hot water supply distribution using solar water heating system.
5.2 State the requirements of good lighting in building.
5.3 Define the terms 1. Glare and 2. Day light factor

5.4 State the precautions to be taken to avoid glare in building
5.5 State the requirements of good electrical wiring.
5.6 List the power rating of different domestic electrical appliances.
5.7 List the different types of electrical wirings.
5.8 State the objectives of electrical earthing.
5.9 Explain the method of earthing
5.10 State the requirements of good ventilation.
5.11 Explain 1. Natural ventilation and 2. Artificial ventilation.
5.12 State the functions of
1. Sunshades,
2. Louvers,
3. Sun breakers and
4.Blinds
5.13 State the principles of fire protection in buildings.
5.14 State the causes of fire.
5.15 Explain about fire fighting.
5.16 State different fire detectors and fire extinguishers.
5.17 State different fire extinguishers
5.18 State different fire resistant building materials.
5.19 Explain about air conditioning.
5.20 State different types of cooling systems.

6.0 Understand Earth quake resistant structures.

6.1 List causes seismic waves, basic terminology
6.2 Explain 1. Magnitude, 2. Intensity and 3. Energy release
6.3 Characteristics of earthquake
6.4 Understand basic terminology of Earthquake
6.5 Explain seismic zoning
6.6 Explain seismic construction with brick stone masonry buildings as per codal provisions.
6.7 Explain seismic construction with stone masonry buildings as per codal provisions.
6.8 Understand seismic construction and detailing of R.C. buildings as per codal provisions.

7.0 Understand the concept of Building Valuation

7.1 Define the terms: 1. Value and 2. Cost and price
7.2 State the need for valuation.
7.3 Explain the following terms:
1. Depreciation,
2. Sinking fund,
3. Annuity and
4. Capitalized value
7.4 Lists different methods of valuation of buildings.
7.5 Explains different methods of valuation of buildings.
7.6 State methods of rent fixation of building.
7.7 Explain methods of rent fixation of building.

COURSE CONTENT

1.0 Concrete Technology

a) Introduction – Ingredients of Concrete – Properties of Concrete – Workability-Factors influencing workability –Water/Cement Ratio-Relation between Strength of concrete and Water/Cement Ratio.
b) Curing of Concrete-Method of curing.
c) Grade of concrete-Controlled concrete and Ordinary concrete-Normal strength concrete and High strength concrete
d) Admixtures – Types of admixtures –Accelerators-Retarders-Plasticizers – Super plasticizers- Uses.
e) Mix design – Factors influencing mix design – Methods of Mix design – IS 10262-2009 method of mix design.
f) Special Concretes – fiber reinforced Concrete – Fal G-Concrete, high density Concrete, Light weight Concrete, polymer Concrete and micro Concrete – Self Compacting Concrete-Properties – uses.
g) Concreting under special exposure condition – cold weather Concreting – hot weather Concreting – under water concreting – Shortcrete – Concreting in high rise buildings.
h) Joints – Necessity of joints – Joints in RCC roofs – Expansion joint – Contraction joint – Construction joint.

2.0 Prestressed Concrete

a) Introduction – Basic principles – Systems of prestressing – Types of prestressing – Advantages and Disadvantages.
b) Requirements of steel and concrete for prestressed concrete.
c) Losses of Prestress.
d) Tensioning devices – Method of Prestressing – Pretensioning system – Post tensioning systems – Freyssinet, Magnel-Blaton, Gifford Udal and LeeMcal Systems.

3.0 Form work and reinforcement

a) Objectives of form work – Loads acting on form work – Component parts of ordinary form work for columns, beams and slabs.(with sketches)
b) Types of formwork based on the material used –Wooden form work-Steel form work.
c) Cleaning and treatment of forms – Stripping time – tolerances.
d) Slip form work for towers and Form work for Lining of canals.
e) Reinforcement – types – Properties as per IS.
f) Bending, Fixing, Placing, Tieing and Welding.

4.0 Construction machinery and equipment

a) Need for use of construction Machinery.
b) Factors affecting selection of equipment.
c) Types – Crawler and Pneumatic tyred.
d) Excavation equipments – Tractors, Bulldozer, Grader, Scrapper, Shovel, Dragline, Clamshell, Dredgers – description-Uses.
e) Compaction equipments – Rollers, Tamping roller – Smooth wheeled roller – Pneumatic tyred rollers – Vibrating compactors – Description – uses.
f) Hauling equipments – Trucks, Dump trucks, Dumpers.

g) Cranes –Tower cranes.
h) Conveying equipments – Belt conveyors.

5.0 Building Services

a) Hot water supply using solar water heating system.
b) Lighting requirements in a building – daylight factor – glare.
c) Electrical services – Requirements of good electrical wiring – types of electrical wirings – earthing – methods.
d) Ventilation – Requirement of good ventilation – Natural and Artificial ventilation – purpose of sunshades, louvers, and blinds.
e) Air conditioning – Purpose – Air conditioning layout – Components –Types of cooling systems – Air coolers – Air conditioner – Centralized Air conditioner – Split type Air Conditioner.

6.0 Earth quake resistant structures

a) Causes of seismic waves – Magnitude, intensity and energy release – basic terminology – Characteristics of earthquake – seismic zoning.
b) Seismic construction of brick and stone masonry buildings – Provisions of I S : 4326.
c) Seismic construction of R.C. Buildings – Detailing as per Provisions of I S : 13920.

7.0 Building Valuation

a) Definition – Value, Cost and Price, Scrap value, Salvage value, Market value, Book value, Sinking fund and its meaning – purpose of valuation – factors governing valuation.
b) Depreciation – Sinking fund – Annuity – Capitalized value.
c) Methods of valuation – Land & building method, Development method, Depreciation method, Rental method, Capitalization method, Profit method, Simple problems on each of the above method.
d) Rent fixation – Rent fixation of building – principles of rent fixation by CPWD – Fair rent method – simple problems.

REFERENCE BOOKS

1. Prestressed Concrete by N Krishna Raju, Mc Graw Hill, New Delhi.
2. Concrete Technology by M S Shetty
3. Building Technology and valuation TTTI, Chennai
4. Hand book on Design of Concrete mixes S.P.23
5. Valuation of Real Properties by S.C.Rangwala

CONSTRUCTION FAILURES, REPAIRS AND MAINTENANCE

Subject Title : Construction failures, repairs and maintenance
Subject Code : CE-604
Periods/ week : 05
Periods/year : 75

TIME SCHEDULE

Sl.No.	Major Topics	Periods	Weightage of Marks	Short Answer Type	Essay Answer Type
1.	Introduction	02	03	1	--
2.	Subsurface construction failures and repairs	15	16	2	1
3.	Surface construction failures and repairs	08	13	1	1
4.	Masonry and concrete failures, repairs	15	26	2	2
5.	Manmade and Natural failures, rehabilitation	15	26	2	2
6.	Maintenance problems and their solutions	20	26	2	2
	Total	75	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Introduction

1.1 Define
1. Error,
2. Defect and
3. Failure

1.2 State different types of errors causing failures.

1.3 State the causes of failures.

2.0 Understand subsurface construction failures and repairs

2.1 Describe construction failures in foundations – Under mining safe support – Load transfer failure – Lateral movement – Unequal support – settlement and differential settlement – Uplift in expansive soils – Design error – Construction error – flotation and water change – vibration effect – earthquake effect.

2.2 Describe the repairs involved for rectifying the above failure.

2.3 Describe Sub surface construction failures – Trenches, sheeting and bracing, piles and caissons – Sewer and tunnels, dams.

2.4 Describes the repairs involved for rectifying the above failures.

3.0 Understand Surface construction failures and repairs

3.1 Briefly describes the following types of failures in surface construction – Slopes and slides – Subsidence, retaining walls and abutments.

3.2 Briefly describes the repairs involved for rectifying the above failures.

4.0 Understand Masonry and concrete failures, repairs

4.1 Describe types of failures in masonry – Wall failure, construction error, aging, joints and cracks, weather tightness, masonry cladding, partitions, ornamental screens, plaster.

4.2 Explain the repairs involved for rectifying the above failures.

4.3 Explain the types of failures in concrete – Improper mix design, curing, placement of reinforcement, Rusting of embedded steel, handling of pre cast elements, shrinkage, expansion and plastic changes, surface disintegration due to fire, spalling of concrete, compression failure, erection difficulty, temperature change, Deformation and cracking – repairs.

4.4 Explain the repairs involved for rectifying the above failure- use of expansion filler.

5.0 Understand Manmade and natural failures and repairs

5.1 Describe the following types of failures in manmade and natural disasters.

5.2 Demolition, deterioration, overload, alteration collapses, fire, explosion and vibration, collision, wind damages, towers and masts, storm at sea, storm on land, lightening damage, rain-ponding effect – Explain the repair's involved for rectifying the above failure.

5.3 Describe the failures due to ignorance and negligence – Ignorance, or incompetence, negligence, control and supervision, responsibility.

5.4 Explain the repairs involved for rectifying the above failures.

6.0 Understand the Maintenance problems and their solutions

6.1 Describes the list of defects in buildings bringing out the investigation and remedial details.

6.2 State the methods of solving dampness problems in buildings.

6.3 Explain the causes, preventive and corrective methods of cracks in building.

6.4 Explain the maintenance operations for the Water supply and sanitary components of building.

6.5 Explain the methods of maintenance of roads / road berms / side drains.

6.6 Explain methods of repairs to canal linings.

6.7 Use of Leak proof chemicals for R.C.C roofs.

COURSE CONTENT

1. Introduction

a) Definition of error, defect, failure – Causes of failures.

2. Sub-surface construction failures and repairs

a) Failures in Foundations – Under mining – Load transfer failures – Lateral movement – Unequal support – Settlement and Differential Settlement –

Uplift in expansive soils compression failure, erection difficulty, temperature change, Deformation and cracking – Drag down and heave – Design error – Construction error – Flotation and water change – Vibration effect – Earthquake effect – repairing techniques to be adopted.

b) Failures during excavation – Sheeting and bracing – piles and caissons – sewers and tunnels – measures to be taken.

3. Surface construction failures and repairs

a) Earthen bunds – failures – slope failures and sliding – subsidence – measures to be taken to prevent surface construction failures – measures to be taken – retaining walls and abutments – geo-membranes – Rivetment and pitching.

4. Masonry and concrete failures, repairs

a) Wall failures – Construction error – Aging – Joints and crakes – Water tightness – Masonry cladding – Partitions – Ornamental screens – Plastering failures - repairs.

b) Concrete failures – Improper mix design, curing, placement of reinforcement and handling of pre cast elements – shrinkage failures – expansion and plastic changes – surface disintegration due to fire – spalling of concrete – repairs.

5. Man-made and natural failures, rehabilitation

a) Demolition – Deterioration – Overload – Alteration collapses – Fire – Explosion and Vibration – Collision – wind damages of towers and masts – Storm at sea – Storm on Land – Lighting damage – rain-ponding – effects – rehabilitation measures.

6. Maintenance problems and their solutions

a) Water proofing, leakage of basements and roofs – Treating dampness in walls – Omission of DPC – Window sills, down pipes and other areas of damp penetration – Cico water proofing.

b) Cracks in walls – Horizontal, Vertical, diagonal – causes and prevention of cracks in buildings – Care of floors, removing stains from floors – Inks, rust, oil, paint and varnish.

c) Maintenance problems of plumbing, heating, hot water supply, clogged drains, sewers, leaking pipe joints, electrical installations, other building services, septic tanks and soak pits.

d) Maintenance of roads, road-berms and side drains.

e) Strengthening of canals, embankments, silt clearance weed removal, repairs to canal lining.

f) Leak proofing of water tanks and roofs use of chemicals for RCC roofs.

REFERENCE BOOKS

1. Construction Failure by Jacob Feld - John Wiley & Sons, New Yark, London.
2. Failures & Repairs of Concrete Structure by S. Champion - John Wiley & Sons, New Yark, London.
3. Engineering Structural Failures by Rolt Hammond – Odham Press, London
4. Learning from Failures by Raikar
5. Building Failures Diagnosis and Avoidance by Ran Son W.H. – Publishing E and F.N. Span.
6. Maintenance Engineering for Civl Engineers-- Nayak B.S. , Khanna Publisher's, Delhi
7. SP: 25 –1987 Causes and prevention of cracks in buildings by BIS

QUALITY CONTROL & SAFETY IN CONSTRUCTION

Subject Title : Quality control & Safety in construction
Subject Code : CE-605
Periods/ week : 04
Periods/year : 60

TIME SCHEDULE

Sl. No	Major Topics	No. of Periods	Weight age of Marks	Short Answer Type	Essay Type
1	Specifications and Standards	12	26	2	2
2	Quality control	06	13	1	1
3	Statistical Analysis and Tolerance	06	13	1	1
4	Introduction to safety in construction Activities	06	16	2	1
5	Causes of Accidents and Safety Measures	24	29	3	2
6	Prevention of accidents	06	13	1	1
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Know different specifications and standards

1.1 State different specifications of buildings.
1.2 Explain functional aspects of different structures.
1.3 Describe detailed specification for various items of work.
1.4 Prepare detailed specification from general description.
1.5 List relevant IS codes.
1.6 Identify sizes for building components.
1.7 Identify standards.
1.8 Understand standards for industrial buildings.
1.9 Explain Management aspects of quality control.
1.10 Describe Advisory Organization.
1.11 Describe Management Functions and Regulations.
1.12 State PWD & CPWD Guidelines for field officers.

2.0 Understand the production and Quality control of construction works and Tolerance levels

2.1 Describe control aspects of batching and mixing.
2.2 Explain the inspection of reinforcement grills.
2.3 Explain the inspection and examination of formwork.
2.4 Describe the quality of the filler materials.

2.5 Establish relationship between the strength of brickwork and strength of mortar.

3.0 Understand statistical basis for modern quality control

3.1 Describe Mathematical probability.
3.2 Describe sampling plan.
3.3 Explain sampling risks of acceptance and rejections.
3.4 State the tolerances levels in construction industry.
3.5 Understand visual appearance.
3.6 State the dimensional accuracies.

4.0 Understand the safety aspects to be taken in construction works

4.1 Describe the safety requirements against fire hazards
4.2 Describe the safety while using construction machinery
4.3 Describe the safety during the demolition of buildings
4.4 Describe the preventive methods of accidents

5.0 Understand the causes of Accidents and Safety measures

5.1 Define accidents.
5.2 List the causes of accidents.
5.3 Role of loss control approach in the cost of the accidents.
5.4 Describe the cost aspects of accidents and measures.
5.5 Describe the General safety program.
5.6 Prepare accidents reports.
5.7 Describe the safety measures to be taken for storage and handling of building materials.
5.8 Describe the safety requirements in formwork and scaffolding.
5.9 Explain the safety in excavation & pile driving in foundation.
5.10 Describe the safety measures to be taken in construction of building elements.
5.11 Describe the safety measures to be taken in demolition of buildings.
5.12 Describe the safety measures to be taken for hot bituminous works.
5.13 Describe the safety measures to be taken in supporting structural work.

6.0 Understand the Planning for accident prevention

6.1 Define 1. Risk and 2. Risk management.
6.2 Explain the role of risk management.
6.3 Describe the planning for accident prevention.
6.4 Evaluate risks and losses and cost control works
6.5 Describe the management measures for controlling losses

COURSE CONTENT

Quality Control

1. (a) Specification for buildings – functional aspects of residential, commercial and industrial structures – Detailed Specifications for various items of work – preparation of detailed specification from general description – Modular Coordination – relevant IS codes – Preferred size for building components – Performance standards – Standards for industrial buildings.

(b) Management aspects of quality control – advisory organization management functions – Statutory regulations – State PWD & CPWD guide lines for field officers.

2. (a) Production & quality control of concrete – general – batching – mixing – inspection of reinforcement grill and form work.
(b) Quality control in Masonry works – quality of filler materials – Brick – stone – quality of mortar – relation between strength of brick work Vs strength of bricks Vs strength of mortar.

3. (a) Statistical basis for modern quality control – Simple examples of mathematical probability – Sampling plan – Sampling risks of acceptance and rejection.
(b) Tolerance levels in construction industry – Visual appearance – dimensional accuracies.

Safety

4. Introduction – safety against fire hazards – Fire & fire fighting – Fire rating of building materials – fire prevention standards – safety in use of construction machinery – lifting machinery, earth moving machinery and conveyors, demolition of buildings – Loading standards for buildings – The safety programme – Accident due to fall – preventive methods.

5. (a) Causes of accidents – Classification of construction accidents – Cost of accidents – loss control approach in the cost of accidents – measurement of accidents – Salient features of 'A safety programme' – General safety programmes for construction – Accident report.
(b) Safety Measure for storage & handling of building materials – Safety Measure in construction of elements of building – Safety in excavation & pile driving – foundations – form work – scaffolding – roofing – safety on fragile roof – other items of work – Safety Measure in demolition of buildings – Safety Measure for hot bituminous works – Safety Measure for scaffolding, Ladders form work and other equipment – erection of prefabricated components and transportation – erection of steel structures – Safety measures for excavation.

6. Planning for accident prevention – evaluation of risk and loss potential in the work. vis-a-vis cost of control measures – loss control approach through accident prevention and other risk management measures for controlling losses due to personnel, legal, liability losses – property losses.

REFERENCE BOOKS

1. Design of Foundations & Detailing by Er.A.Veerappan & Er. A.Pragadeeswaran
2. A.J. and C.J.Willis. “Specification writing”, Crossby Lockwood, London.
3. Norbert-L.Enrick “Quality control and reliability” Industrial press Inc., NY
4. R. Nagrajan, “Standards In Buildings”, Pitman publishing, 1976.
5. Vincent G.Bush, “Safety in Construction industry-OSHA”
6. Estimation and Costing by Dutta
7. S.Purushotham & G. Vaidyanathan “Safety in Construction Industry”, Central Labour Institute, Bombay
8. “Accident Prevention in Construction”, Associated General Contractors of America
9. Standards on safety—BIS
10. Norbert-L.Enrick “Quality control and reliability” Industrial press Inc.,NY
11. R. Nagarajan, “Standards In Buildings”, Pitman publishing, 1976
12. Shrivastava, U.K., “Construction Planning and Management”, Galgotia Publications Pvt. Ltd, # 5, Ansari road, Daryaganj, New delhi.
13. Design and Construction failures by DOV Kamimanetzky, Galgotia publications, New Delhi.

CIVIL ENGINEERING WORK SHOP

Subject title : Civil Engineering Workshop
Subject code : CE-606
Periods per week : 03
Periods per semester : 45

TIME SCHEDULE

Sl. No.	Major Topic	No. of periods
1	Carpentry	5
2	Bar Bending of steel reinforcement	10
3	Plumbing exercises	10
4	Electrical Exercises	20
Total		45

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the elements of carpentry in connection with the erection of scaffolding and form work with a particular reference to use of braces

1.1 State various components of scaffolding
1.2 State precautions to be taken while erecting scaffolding
1.3 Explain the method of fixing various elements of scaffolding
1.4 State precautions to be taken to fix the various elements of scaffolding at required position.
1.5 Connect various elements of scaffolding.
1.6 Explain various aspects of form work to be considered while fixing various elements
1.7 Explain the method of fixing of form work at required position for various elements of building construction
1.8 Connect various elements of formwork.

2.0 Understand the skills of bending of reinforcing bars as per the bar bending schedule.

2.1 Identify various tools used for bending of reinforcing bars.
2.2 Read the data required from bar bending schedule for bending of bars.
2.3 Mark the salient points of location of bending on the bars as per the bar bending schedule.
2.4 Bend the bars using the specified tools to the exact shape as per bar bending schedule as specified in IS-2502(Code of practice for bending and fixing of bars for concrete reinforcement)
2.5 Prepare the grills as per the drawings of the structural elements using binders, stirrups, links etc. appropriate to the element.

3.0 Understand the elements of plumbing practice and procedure of fixing of various plumbing fixtures

3.1 Identify the different pipe specials and state their functions
3.2 Practice thread cutting on PVC/GI pipes
3.3 Assemble the pipe line for toilet block with taps, showers and wash basins using specific pipe specials.
3.4 Fix the floor trap, gully trap and water closet of a house to the drainage pipes.

4.0 Understand the various aspects of electrical installations used in buildings and their fixing at appropriate locations

4.1 Identity various electrical accessories, Wires and cables
- a. Mains switch
- b. MCB
- c. Fuse
- d. Switches (SPST SPDT)
- e. Rotary switch
- f .Push Button Switches
- g. 2 pin Sockets
- h. 3pin /Power sockets
- i. Ceiling Rose
- g. Lamp Holders.
  - (a) Identify line, neutral and earth terminals in power sockets and power plugs by physical observation and using Tester
- h. Use of test lamp

4.2 Identify different wires and cables
- a. Know the wire gauge
- b. Specifications of electrical wires
- c. VIR, PVC, TRS wires
- d. Flexible wires and cables
- e. Power cords.

4.3 Study of earthling and earth pit
4.4 Study of different wiring systems
- (a) Open conduit system
- (b) Concealed conduit system

4.5 Use of Digital Multimeter to
- a. Identify the Range selector
- b. Selection of appropriate range to measure
  - i. AC Voltage
  - ii. DC Voltage (Battery)
  - iii. AC Current (Through a lamp/heater)
  - iv. Check continuity
  - v. Resistance

4.6 Connect a fuse in the main circuit
- a. Know the metals suitable for fuse wire
- b. Selecting a correct fuse wire rating for a given electrical load

4.7 Connect a low current (3A) MCB in the circuit and testing
4.8 Control the lamp using a switch
4.9 Control the fan with a switch and regulator
4.10 Connect a i) 2-pin socket ii) 2-pin socket with switch control
4.11 Control one lamp with 2 switches (Staircase wiring)
4.12 Know Power consumption of various Appliances like
1. Tungsten Lamp
2. CFL Lamp

3. Fan.
4. Fluorescent lamps (Tube Lights).
5. Air cooler
6. Water heater,
7. Geiser
8. Electric Iron

4.13 Estimate the total connected load
4.14 Study of inverter/UPS wiring
4.15 Electrical estimation and costing
4.16 Study of 3-phase system

KEY Competencies to be achieved by the student

S. No	Experiment Title	Competencies	Key Competency
1	Fixing of scaffolding	• Measuring lengths of props accurately • Fixing braces at required locations correctly to support various other scaffolding members • Choosing suitable size of members to support load coming over the scaffolding	• Measuring lengths of props accurately • Choosing suitable size of members to support load coming over the scaffolding
2	Positioning of form work	• Adjusting the lengths of props correctly to support the weight of RCC elements • Fixing up of various elements of form work firmly to support the weight of RCC elements	• Fixing up of various elements of form work firmly to support the weight of RCC elements
3	Bar Bending of steel reinforcement	• Cutting of rods to the suitable lengths correctly • Maintaining the angle of cranking correctly • Maintaining required spacing of rods as per the design and drawings provided	• Cutting of rods to the suitable lengths correctly • Maintaining the angle of cranking correctly
4	Plumbing Exercises	• Using appropriate tools • Selection of suitable pipe specials • Making connections to various sanitary installations	• Making connections to various sanitary installations
5	Electrical Exercises	• Adopting suitable type of electrical fixtures for intended usage • Using suitable material in required quantities for making earthling for an electrical installation	• Using suitable material in required quantities for making earthling for an electrical installation

COURSE CONTENT

1. Carpentry

a. Erection of Scaffolding Material
b. Position of Shuttering
c. Fixing of form work.

2. Bar Bending of steel reinforcement

Preparation of bar bending schedule

(a) Bar bending with bar bending schedule
(b) Method of bar bending for Earthquake resistant structures
(c) Filed visit to automated bar bending

3. Plumbing exercises

a. Thread cutting on GI/PVC pipes
b. Assembling of pipe lines for toilet with two taps, shower and wash basin
c. Fixing of floor traps, gully traps, water closet, drain pipes
d. Laying stoneware/PVC pipes and construction of inspection chambers

4. Electrical Exercises

i. Identity various electrical accessories
ii. Identify line, neutral and earth terminals in power sockets and power plugs
iii. Measure the AC voltage between line and neutral using DMM
iv. Study of earthing and earth pit
v. Study of different wiring systems
    1. Open conduit system
    2. Concealed conduit system
vi. Measurement of the following using DMM
    1. AC Voltage
    2. DC Voltage (Battery)
    3. AC Current (Through a lamp/heater)
    4. Check continuity
    5. Resistance
vii. Connecting a fuse in the main circuit
viii. Controlling the lamp using a switch
ix. Controlling the fan with a switch and regulator
x. Connect a i) 2-pin socket ii) 2-pin socket with switch control
xi. Control one lamp with 2 switches (Staircase wiring)
xii. Study of inverter/UPS wiring
xiii. Electrical estimation and costing
xiv. Study of 3-phase system

STRUCTURAL ENGINEERING DRAWING

Subject Title : Structural Engineering Drawing
Subject Code : C-607
Periods per Week : 06
Periods per Semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Structural Planning and marking of Frame components	09	04	01	-
2.	R.C.C. Drawings	42	28	02	01
3.	Reading and interpretation of Structural Drawings	09	04	01	-
4.	Steel Drawings	30	24	01	01
Total		90	60	05	02

NOTE: All questions are to be answered. Part-A: 5X4=20 marks & Part-B: 2X20=40 marks

NOTE: Use HYSD bars for main reinforcement**.**

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand structural planning of a building and marking of Frame components

1.1 Understand Positioning and Orientation of columns
1.2 Understand Positioning of beams
1.3 Understand Spanning of slabs
1.4 Explain layout of stairs
1.5 List types of footings
1.6 Prepare member reference scheme of given building following
   1. Column reference scheme and
   2. Grid reference scheme (Scheme recommended by IS:5525 – recommended for detailing of reinforced concrete works and SP-34)

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2.0 Draw the detailed working drawings of R.C.C.

2.1 Draw the longitudinal section and cross sections of singly reinforced simply supported beam.

2.2 Prepare schedule of reinforcement and quantity of steel for singly reinforced simply supported beam

2.3 Draw the longitudinal and cross section of lintel cum sunshade

2.4 Prepare schedule of reinforcement and quantity of steel for lintel cum sunshade

2.5 Draw the plan and longitudinal section of one-way slab showing reinforcement details.

2.6 Prepare schedule of reinforcement and quantity of steel for one-way slab showing reinforcement details

2.7 Draw the details of reinforcement of two-way simply supported slab with corners not held down condition.

2.8 Draw top and bottom plan and section along short and long spans of two-way simply supported slab with corners not held down condition

2.9 Prepare schedule of reinforcement of two-way simply supported slab with corners not held down condition

2.10 Draw the details of reinforcement of two-way simply supported slab with corners held down conditions.

2.11 Draw top and bottom plan and section along short and long spans have to be drawn. (Scheduling of reinforcement is not necessary).

2.12 Draw the details of reinforcement of one-way continuous slab along with T-beam with details of slab and T-beam (plan and section of continuous slab and longitudinal section of T-beam have to be drawn). (Scheduling of steel is not necessary)

2.13 Draw the details of column and square footing (plan and sectional elevation) prepare schedule of reinforcement of column and footing and quantity of steel required.

2.14 Draw the reinforcement details of dog legged stair case (section only) repare schedule of reinforcement for one flight including landing.

3.0 Read and interpret the drawings

3.1 Understand the details of reinforcement from the given drawings

3.2 Fill in the details of reinforcement in a drawing.

4.0 Draw the detailed working drawings of steel structures

4.1 Draw the sectional plan, elevation and cross section of built up beam showing the details of curtailment of plates and connection details.

4.2 Draw the details of built up column with lacing and batten system showing the details of connections by welding (plan, elevation with three systems of lacing/batten systems)

4.3 Draw the details of steel column base with details of gusset plate. Plan, section parallel to web, section parallel to flange showing the connections with welded joints.

4.4 Draw the details of Fan roof truss with angular and tubular sections along with details of connections at ridge, heel, bottom chord and roof coverings (welded connections).

4.5 Draw the details of reinforcement of frame designed as earth quake resistant structure.

COURSE CONTENT

1. a) Draw the position of columns, beams, slabs, stairs and footing in a given line diagram of building
   b) Prepare member reference scheme of given building following
      i) Column reference scheme as per IS:696 code of practice for general engineering drawing.
      ii) Grid reference scheme as per IS:5525 – recommendations for detailing of reinforced concrete works.
2. Singly reinforced simply supported rectangular beam.
3. Lintel cum sunshade.
4. Simply supported one-way slab.
5. Two-way slab simply supported corners not held down.
6. Two-way slab simply supported corners held down.
7. One-way continuous slab and T-beam (with details of slab and T-beam)
8. Column with square footing of uniform thickness.
9. Stair case – stairs spanning longitudinally (Dog legged stair case)
10. Built up beam with two cover plates with details of curtailment of plates.
11. Built up column with lacing and battening systems.
12. Gusseted column base (with welded connections),
13. Fan roof truss – 8 m span with angular and tubular sections connected by welding.
14. Frame showing the details of reinforcement for earth quake resistant structures.

REFERENCE BOOKS

1. Designing and detailing hand book SP-34

CONSTRUCTION TECHNOLOGY PRACTICE

Subject Title	**:**	**Construction Technology Practice**
Subject Code	**:**	**CE-608**
Periods/ Week	**:**	**03**
Periods/Semester	**:**	**45**

TIME SCHEDULE

Sl.No	List of Experiments	No. of periods
	Tests on Road Aggregate	15
1	Specific Gravity of fine and coarse aggregate	
2	Impact value of coarse aggregate	
3	Crushing value of coarse aggregate	
4	Abrasion value of coarse aggregate	
5	Flakiness Index of coarse aggregate	
6	Elongation Index of coarse aggregate	
	Tests on Concrete	20
7	Slump test on concrete	
	(a) Study the changes in workability by adding cement paste to poorly workable concrete	
	(b) Study the changes in workability by adding dry cement to poorly workable concrete	
8	Compaction factor test on concrete	
	(a) Study the changes in compactor of a poorly workable concrete by admixtures	
	(b) Study the methods of enhancing workability of concrete without using any admixtures	
9	Casting of Cement concrete cubes	
10	Testing of cement concrete cubes for compression	
	(a) Compare the compressive strengths of concrete cubes made and cured with potable water and concrete cubes made and cured with non-potable water	

	(b) Compare the compressive strengths of concrete cubes of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate	
11	Split Tensile Strength of concrete	
12	Design mix of concrete proportion	
	Non-destructive tests on concrete	5
13	(a) Surface hardness test(Rebound hammer)	
14	(b) Ultrasonic test	
	Tests on Soil	10
15	Sieve Analysis – Classification of soil	
16	Field Density of soil(Sand Replacement Method)	
17	Proctor Compaction Test	
	Total:	45

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 **Determine suitability of given sample of aggregate for road construction**
Specific Gravity of fine and coarse aggregate

1.1 Study the importance of specific gravity of fine and coarse aggregate
1.2 State the range of specific gravity values for various naturally available fine and coarse aggregate
1.3 Use the apparatus required for conducting specific gravity test on both fine and coarse aggregate
1.4 Perform the specific gravity tests for both fine and coarse aggregate

Impact value of coarse aggregate

1.5 Study the significance of impact value of aggregate used for road construction
1.6 State the standards on impact value of aggregate used for various civil engineering works as per IS-383
1.7 Use the apparatus required for conducting impact test on aggregate
1.8 State the procedure for preparing the sample and no.of samples required for the given work
1.9 Explain the procedure for conducting impact test on aggregate
1.10 Perform impact test on given sample of coarse aggregate
1.11 Draw inferences by conducting impact test on different types of natural aggregate

Crushing value of coarse aggregate

1.12 Study the significance of crushing value of aggregate used for various civil engineering works
1.13 State the standards on crushing value of aggregate used for various civil engineering works as per IS-383
1.14 Use the apparatus required for conducting crushing test on aggregate
1.15 State the procedure for preparing the sample and no.of samples required for the given work
1.16 Explain the procedure for conducting crushing test on aggregate
1.17 Perform crushing test on given sample of coarse aggregate
1.18 Draw inferences by conducting crushing test on different types of natural aggregate

Abrasion value of coarse aggregate

1.19 Study the significance of abrasion value of aggregate used for various civil engineering works
1.20 State the standards on abrasion value of aggregate used for various civil engineering works as per IS-383
1.21 Use the apparatus required for conducting abrasion test on aggregate
1.22 State the procedure for preparing the sample and no.of samples required for the given work
1.23 Explain the procedure for conducting abrasion test on aggregate
1.24 Perform abrasion test on given sample of coarse aggregate
1.25 Draw inferences by conducting abrasion test on different types of natural aggregate

Flakiness Index of coarse aggregate

1.26 Study the significance of flakiness index of aggregate on strength and workability properties of concrete
1.27 State the standards on flakiness index of aggregate
1.28 Use the apparatus required for conducting flakiness index of coarse aggregate
1.29 Explain the procedure for conducting the flakiness index test on coarse aggregate

Elongation Index of coarse aggregate

1.30 Study the significance of elongation Index of aggregate on strength and workability properties of concrete
1.31 State the standards on elongation Index of aggregate
1.32 Use the apparatus required for conducting elongation Index of coarse aggregate
1.33 Explain the procedure for conducting the elongation Index test on coarse aggregate
2.1 Determine suitability of fresh and hardened concrete for the given conditions of workability and strength
2.2 Study the importance of workability on strength properties of concrete
2.3 State various types of tests used for measuring the workability of fresh concrete
2.4 State standards on workability of concrete used for different places of construction work

Slump cone test

2.5 Use apparatus required for conducting slump test
2.6 Explain the procedure for conducting slump test of workability
2.7 Perform slump test on the concrete made of given sample of ingredients
2.8 Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different elongation index
2.9 Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different flakiness index

2.10 Compare the slumps of concrete made with gap graded coarse aggregate and well graded coarse aggregate
2.11 Study the changes in workability by adding cement paste to poorly workable concrete
2.12 Study the changes in workability by adding dry cement to poorly workable concrete

Compaction factor test

2.13 State the purpose of compaction of concrete
2.14 Use apparatus required for conducting compaction factor test
2.15 Explain the procedure for conducting compaction factor test of workability
2.16 Perform compaction factor test on the concrete made of given sample of ingredients
2.17 Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different elongation index values
2.18 Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different flakiness index values
2.19 Compare the compaction factors of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate
2.20 Study the changes in compactor of a poorly workable concrete by admixtures
2.21 Study the methods of enhancing workability of concrete without using any admixtures

Casting of Cement concrete cubes

2.22 Study the purpose of casting of concrete cubes
2.23 Use equipment required for casting of cement concrete cubes
2.24 Explain the procedure for casting concrete cubes
2.25 Cast the concrete cubes with given ingredients

Testing of cement concrete cubes for compression

2.26 Study the importance of testing concrete cubes
2.27 Use equipment required for conducting compression test concrete cubes
2.28 State the precautions to be taken for testing of concrete cubes
2.29 Explain the procedure for conducting compression test on concrete cubes
2.30 Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different elongation index values
2.31 Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different flakiness index values
2.32 Compare the compressive strengths of concrete cubes of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate
2.33 Compare the compressive strengths of concrete cubes made and cured with potable water and concrete cubes made and cured with non-potable water

Split Tensile Strength of concrete

2.34 Study the importance of split tensile strength of concrete
2.35 Cast the concrete cylinders with given ingredients
2.36 Explain the procedure for conducting split tensile strength test on concrete cylinders
2.37 Perform split tensile strength test on concrete cylinder

Design mix of concrete proportion as per IS: 10262 - 2009

2.38 Study the various elements of design mix of concrete as per IS:10262-2009
2.39 Conduct tests to find specific gravity, bulk density and sieve analysis of aggregate for the preparation of design mix of concrete
2.40 Write the procedure for design mixing of concrete
2.41 Calculate the proportions of ingredients of concrete as per IS:10262-2009

2.42 Cast cubes of trail mixes to decide the proportion of concrete
2.43 Perform the compression tests on concrete cubes casted as per design mix
3.0 Understand the significance of various non-destructive tests on concrete
3.1 State the importance of non-destructive tests
3.2 State the apparatus/equipment required for the non-destructive tests
3.3 Explain the procedure for conducting non-destructive tests
3.4 Perform the non-destructive tests like Rebound hammer tests, ultrasonic tests on the given hardened concrete
3.5 Record the observations of tests
3.6 Draw the inferences from the test results
4.0 Determine various engineering properties of soils used for various Civil Engineering Activities

Sieve Analysis – Classification of soil

4.1 Study the classifications of various types of soils
4.2 Use apparatus required for conducting sieve analysis of soils
4.3 Explain the procedure for conducting sieve analysis of soils
4.4 Perform sieve analysis over a given soil sample

Atterberg Limits of Soil

4.5 Study the significance of Atterberg limits of soil in civil engineering activities
4.6 Study Atterberg limits of soils
4.7 Use apparatus required for conducting tests to determine Atterberg limits of soil
4.8 Explain the procedure for conducting Atterberg limits of soil
4.9 Perform tests to determine liquid limit, plastic limit, shrinkage limit and plasticity index of a given soil sample
4.10 Calculate the values of Atterberg limits of given soil sample from the observations of tests
4.11 Classify given soil sample based on sieve analysis and Atterberg limits

Field Density of soil (Sand Replacement Method)

4.12 Study the significance of field density of soil
4.13 Use the apparatus required for conducting field density of soil
4.14 Explain the procedure for conducting field density test on soil by sand replacement method
4.15 Perform field density test of soil by sand replacement method

Proctor Compaction Test

4.16 Study the significance of proctor compaction test
4.17 Use the apparatus required for conducting proctors compaction test
4.18 Explain the procedure for conducting proctor compaction test
4.19 Perform proctor compaction test over given sample of soil
4.20 Compare the observations of tests conducted on different types of soils
4.21 Draw the graph for proctor's compaction test
4.22 Calculate the values OMC and MDD of given soil sample from the observations of test

KEY Competencies to be achieved by the student

S. No	Experiment Title	Competencies	Key Competency
1	Specific Gravity of fine and coarse aggregate	• Take weights of empty pycnometer, pycnometer with water and pycnometer with aggregate accurately • Record the observations accurately • Calculate the values correctly	• Take weights of empty pycnometer, pycnometer with water and pycnometer with aggregate accurately
2	Impact value of coarse aggregate	• Prepare of sample correctly • Weigh the cup and aggregate accurately • Count number of strokes accurately • Weigh residue retained on 2.36 mm sieve correctly	
3	Crushing value of coarse aggregate	• Prepare of sample correctly • Weigh the mould and aggregate accurately • Apply the load at required rate and to the required period accurately • Weigh residue retained on 2.36 mm sieve correctly	• Apply the load at required rate and to the required period accurately
4	Abrasion value of coarse aggregate	• Weigh the aggregate accurately • Count the required number of rotations correctly • Weigh residue retained on 1.70 mm sieve accurately	
5	Flakiness Index of coarse aggregate	• Arrangement of sieves in correct order • Weighing the aggregate passing through thickness gauge correctly •	
6	Elongation Index of coarse aggregate	• Arrange the sieves in correct order • Weigh the aggregate retaining over length gauge correctly	
7	Slump cone test on concrete	• Weigh the material accurately • Apply required no.of tampings for each layer of concrete • Measure the subsidence accurately	• Measure the subsidence accurately

8	Compaction factor test on concrete	• Weigh the material accurately • Weigh the mould and concrete accurately • Calculate the compactor factor correcly	•
9	Casting of Cement concrete cubes	• Weigh the material accurately • Vibrate the concrete filled in moulds to the required time correctly • Cure the demoulded cubes to the required period	• Weigh the material accurately • Vibrate the concrete filled in moulds to the required time correctly
10	Testing of cement concrete cubes for compression	• Apply the load at required rate correctly • Record the load at FAILURE accurately • Calculate the compressive strength accurately	• Apply the load at required rate correctly
11	Split Tensile Strength of concrete	• Apply the load at required rate correctly • Record the load at FAILURE accurately • Calculate the split tensile strength accurately	• Apply the load at required rate correctly • Calculate the split tensile strength accurately
12	Design mix of concrete proportion	• Calculate the proportions of material correctly • Weigh the ingredients of concrete accurately as per design mix calculations	• Calculate the proportions of material correctly
13	Non-destructive tests on concrete	• Applying the load at required rate as per procedure correctly • Calculating the strength of hardened concrete from graphs accurately	• Applying the load at required rate as per procedure correctly
14	Sieve Analysis – Classification of soil	• Weigh of residue in each sieve accurately	•
15	Field Density of soil(Sand Replacement Method)	• Calibrate the apparatus correctly • Weigh the samples accurately • Calculate the density accurately	• Calibrate the apparatus correctly • Weigh the samples accurately

16	Proctor Compaction Test	• Weigh the soil correctly • Measure the water accurately • Apply required no.of blows of compaction accurately • Record the observations correctly • Draw graph correctly	• Weigh the soil correctly • Measure the water accurately • Draw graph correctly

COURSE CONTENT

1. **Tests on Road aggregate**
    d. Specific Gravity of fine and coarse aggregate
    e. Impact value of coarse aggregate
    f. Crushing value of coarse aggregate
    g. Abrasion value of coarse aggregate
    h. Flakiness index of coarse aggregate
    i. Elongation index of coarse aggregate
2. **Tests on concrete**
    a. Workability test by Slump Cone Test
    b. Workability test by Compaction factor test
    c. Casting of Cement concrete cubes
    d. Testing of Cement concrete cubes for compression
    e. Split tensile strength of concrete
    f. Design mix of concrete proportion
3. **Non-destructive tests on concrete**
    a. Surface hardness test(Rebound hammer test)
    b. Ultrasonic Test
4. **Tests on Soil**
    a. Sieve analysis-classification of soil.
    b. Liquid limit and plastic limit
    c. Field density of soil (sand replacement method)
    d. Proctor Compaction Test

REFERENCE BOOKS

1. Concrete Technology – M.S. Shetty,
   S. Chand & Company Ltd., New Delhi.
2. Concrete Technology(5/E) – M.L. Gambhir-TMH
3. Soils Mechanics – B.C. Punmia
4. Engineering Properties of soils and their measurement –
   Joseph E. Bowles – TMH

PROJECT WORK

Subject Title	**:**	**Project Work**
Subject Code	**:**	**CE-609**
Periods/Week	**:**	**07**
Periods/Semester	**:**	**105**

OBJECTIVES

1.1 Identifies different works to be carried out in the Project.
1.2 Collects data relevant to the project.
1.3 Carries out Site Surveys.
1.4 Selects the most efficient method from the available choices based on preliminary investigation.
1.5 Designs the required elements of the project as per standard practices.
1.6 Prepares working drawings for the project.
1.7 Estimates the cost of project, men, materials and equipment required.
1.8 Prepares schedule of time and sequence of operations.
1.9 Prepares project report.
1.10 Prepares C.P.M. Chart.
1.11 Collects the requirements to start a Small Enterprise/Industry under Self Employment Scheme.
1.12. Collects the necessary information to procure necessary finance, site and equipment.
1.13 Prepares the chart or model for each project.

COURSE CONTENT

Project work is intended to provide training in the solution of field engineering problems involving Surveying, Planning, drawing plans, designing, estimating and marking out of a building/highway/irrigation/public health project. Project work will also include the preparation of the feasibility report for any one type of enterprise under self – employment schemes.

Students shall be divided into groups of five each and shall be assigned a problem that calls for application of the knowledge he/she acquired in the course and also which involves some extra study of reference materials.

Problems

a) Planning of a Campus.
b) Building project.
c) Industrial complex
d) Irrigation project.
e) Rural Water Supply Scheme.
f) Sanitary Engineering Scheme.
g) Bridge project.
h) Low Cost Housing Scheme.
i) Design of framed structure type building by using a software package.
j) Set up of a small enterprise under self employment scheme.

Every student should prepare a project report and submit the same for assessment. Every student puts his share to the work in all the operations of the project. The end examination in Project work shall consist of power point presentation and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and member of staff who guided the project as Internal examiner.

Scheme of assessment

1)	Seminar	-	20 Marks
2)	Internal assessment	-	20 Marks
3)	Power point presentation & Viva – Voce	-	60 Marks (3x20)
	Total		**100**

DIPLOMA IN MECHANICAL ENGINEERING

SCHEME OF INSTRUCTIONS AND EXAMINATIONS
(FIRST YEAR)

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
ME-101	English	3	-	90	3			100
ME-102	Engineering Mathematics - I	5	-	150	3			100
ME-103	Engineering Physics	4	-	120	3			100
ME-104	Engineering Chemistry &Environmental Studies	4	-	120	3			100
ME-105	Engineering Mechanics	4	-	120	3			100
ME-106	Workshop Technology	4	-	120	3			100
PRACTICAL:								
ME-107	Engineering Drawing practice	-	6	180	3			100
ME-108	Basic Work shop practice	-	6	180	3			100
ME-109	109-A Engineering Physics Lab practice 109-B Engineering Chemistry Lab practice	-	3	90	3 (1.5+1.5)			100 (50+50)
ME-110	Computer fundamentals Lab practice	-	3	90	3			100
	TOTAL	24	18	1260				1000

ENGLISH

(Common to all Branches)

Subject Title : English
Subject Code : ME - 101
Periods per Week : 03
Periods per Year : 90

Time Schedule

Sl No	Major Topics	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary	5	13	1	1
2	Grammar	30	31	7	1
3	Reading	10	10	-	1
4	Writing	30	40	-	4
5	English in Action	15	16	2	1
		90	110	10	08

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-14 Curriculum the focus is on the special English needs of technician studies and training. This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing repots, giving instructions and interpreting graphics is of great importance. Therefore the curriculum C-14 focuses on improving communicative abilities equipping the students to become industry- ready and employable.

Upon completion of this course the student shall be able to

1.0 Build their vocabulary in the direction of their future needs
2.0 Learn various grammatical structures
3.0 Read and comprehend English and understand the details and draw inferences
4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs

1.1 Locate words, learn spellings, understand meanings
1.2 Pronounce words intelligibly
1.3 Find synonyms and antonyms

1.4 Use affixation
1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures
2.1 Identify and use nouns
2.2 Identify and use pronouns
2.3 Use the present tense
2.4 Use the past tense
2.5 Use the future tense
2.6 Identify and use adjectives
2.7 Identify and use adverbs
2.8 Use prepositions
2.9 Use linkers
2.10 State basic sentence structures
2.11 Construct different types of sentences
2.12 Frame questions to elicit information
2.13 Frame questions for conformation
2.14 Use active voice
2.15 Use passive voice
2.16 Use direct speech
2.17 Use indirect speech
2.18 Identify and correct errors

3.0 Read and comprehend English
3.1 Identify the main ideas
3.2 Identify the specific details
3.3 Draw inferences
3.4 Give contextual meanings of the words
3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)
4.1 Identify components of a good paragraph
4.2 Write types of paragraphs
4.3 Distinguish between formal and informal letters
4.4 Write personal letters
4.5 Write leave letters
4.6 Write official letters
4.7 Write letters of complaints
4.8 Prepare a resume
4.9 Write a cover letter
4.10 Write short messages
4.11 Report incidents
4.12 Report experiments
4.13 Report Industrial visits
4.14 Write work done statements
4.15 Write maintenance reports
4.16 Make notes using Cue method and Mapping method
4.17 Summarize Paragraphs
4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

5.0 Practice spoken communication suited to various situations.

5.1 Use appropriate expressions to greet and take leave
5.2 Use proper expressions to make requests
5.3 Use apt expressions for asking and giving directions
5.4 Use suitable expressions to seek and offer suggestions
5.5 Use suitable expressions to state intentions
5.6 Use suitable expressions to state feelings
5.7 Use appropriate expressions to state agreement and disagreement
5.8 Use proper expressions to make complaints
5.9 Use suitable expressions to express obligations

Course Material

The textbook prepared by the faculty of English of Polytechnics in AP.

Reference Books

1. Essential English Grammar (Intermediate Level) Raymond Murphy
2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary) Santanu Sinha Chaudhuri
3. Grammar Builder (Entire Series) Oxford University Press
4. High School English Grammar (Revised Edition) Wren and Martin
5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill) John Langan, Paul Langan
6. Word Power Made Easy Norman Lewis
7. Spoken English Shashi Kumar and Dhamija

ENGINEERING MATHEMATICS – I
(Common to all Branches)

Subject Title : Engineering Mathematics-I
Subject Code : ME-102
Periods per week : 04
Periods per Semester : 60

Blue print

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
	Unit - I : Algebra	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
1	Logarithms	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	½
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0
	Unit III : Co-ordinate Geometry									
13	Straight Lines	4	2	3	1	0	0	0	0	0
14	Circle	4	2	3	1	0	0	0	0	0
15	Conic Sections	5	4	10	0	0	0	0	1	0

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
Unit – IV : Differential Calculus										
16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
Unit - V : Applications of Differentiation										
18	Geometrical Applications	3	2	5	0	0	0	0	0	½
19	Physical Applications	2	2	5	0	0	0	0	0	½
20	Maxima and Minima	3	4	5	0	0	0	0	0	½
21	Errors and Approximations	2	0	5	0	0	0	0	0	½
	Total	92	58	110	7	3	0	2	2 1/2	3 ½
				Marks	21	9	0	20	25	35

R: **Remembering type** 41 marks
U: **Understanding type** 34 marks
App: **Application type** 35 marks

Objectives
Upon completion of the course the student shall be able to
UNIT – I
Algebra
1.0 Use Logarithms in engineering calculations

1.1 Define logarithm and list its properties.

1.2 Distinguish natural logarithms and common logarithms.

1.3 Explain the meaning of e and exponential function.

1.4 State logarithm as a function and its graphical representation.

1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

2.1 Define the following fractions of polynomials:

1. Rational,
2. Proper and
3. Improper

2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \dfrac{f(x)}{(x+a)(x+b)(x+c)}$ $\qquad ii)\quad \dfrac{f(x)}{(x+a)^2(x+b)(x+c)}$

$iii)\quad \dfrac{f(x)}{(x^2+a)(x+b)}$ $\qquad iv)\quad \dfrac{f(x)}{(x+a)(x^2+b)^2}$

3.0 Use Matrices for solving engineering problems

3.1 Define a matrix and order of a matrix.

3.2 State various types of matrices with examples (emphasis on 3rd order square matrices).

3.3 Compute sum, scalar multiplication and product of matrices.

3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.

3.5 Define the transpose of a matrix and write its properties.

3.6 Define symmetric and skew-symmetric matrices.

3.7 Resolve a square matrix into a sum of symmetric and skew- symmetric matrices with examples in all cases.

3.8 Define minor, co-factor of an element of a 3x3 square matrix with examples.

3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.

3.10 Distinguish singular and non-singular matrices.

3.11 Apply the properties of determinants to solve problems.

3.12 Solve system of 3 linear equations in 3 unknowns using Cramer's rule.

3.13 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.

3.14 Compute adjoint and multiplicative inverse of a square matrix.

3.15 Solve system of 3 linear equations in 3 unknowns by matrix inversion method

3.16 State elementary row operations.

3.17 Solve a system of 3 linear equations in 3 unknowns by Gauss- Jordan method

UNIT – II
Trigonometry :

4.0 Understand Trigonometric Ratios

4.1 Define trigonometric ratios of any angle.

4.2 List the values of trigonometric ratios at specified values.

4.3 Draw graphs of trigonometric functions

4.4 Explain periodicity of trigonometric functions.

5.0 Solve simple problems on Compound Angles

5.1 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B)

5.2 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

5.3 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.,

5.4 Solve simple problems on compound angles.

6.0 Solve problems using the formulae for Multiple and Sub- multiple Angles

6.1 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.

6.2 Derive useful allied formulas like $\sin A = (1 - \cos 2A)/2$ etc.,

6.3 Solve simple problems using the above formulae

7.0 Apply Transformations for solving the problems in Trigonometry

7.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.

7.2 Solve problems by applying these formulae to sum or difference or product of three or more terms.

8.0 Use Inverse Trigonometric Functions for solving engineering problems

8.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

8.2 Define inverses of six trigonometric functions along with their domains and ranges.

8.3 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.

8.4 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ etc.

8.5 Derive formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, $where\ x \geq 0, y \geq 0, xy < 1$ etc.,

8.6 Solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

9.1 Explain what is meant by solutions of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.

9.2 Solve models of the type $a\sin^2 x + b\sin x + c = 0$, $a\cos x + b\sin x = c$ etc., and problems using simple transformations.

10.0 Appreciate Properties of triangles and their solutions

10.1 State sine rule, cosine rule, tangent rule and projection rule.

10.2 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter and sides a, b, c and solve problems.

10.3 List various formulae for the area of a triangle.

10.4 Solve problems using the above formulae.

10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

11.1 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.

11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

12.1 Define complex number, its modulus , conjugate and list their properties.

12.2 Define the operations on complex numbers with examples.

12.3 Define amplitude of a complex number

12.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.

12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT - III

Coordinate Geometry

13.0 Solve the problems on Straight lines

13.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form

13.2 Solve simple problems on the above forms

13.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

14.0 Solve the problems on Circles

14.1 Define locus of a point – circle and its equation.

14.2 Find the equation of a circle given

(i) Center and radius

(ii) Two ends of a diameter

(iii) Centre and a point on the circumference

(iv) Three non collinear points

(v) Centre and tangent

14.3 Write the general equation of a circle and find the centre and radius.

14.4 Write the equation of tangent and normal at a point on the circle.

14.5 Solve the problems to find the equations of tangent and normal.

15.0 Appreciate the properties of Conics in engineering applications

15.1 Define a conic section.

15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.

15.3 Find the equation of a conic when focus, directrix and eccentricity are given

15.4 Describe the properties of Parabola, Ellipse and Hyperbola

15.5 Solve engineering problems in simple cases of Parabola and Ellipse.

UNIT - IV

Differential Calculus

16.0 Use the concepts of Limit and Continuity for solving the problems

16.1 Explain the concept of limit and meaning of $\lim_{x\to a} f(x)=l$ and state the properties of limits .

16.2 Mention the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ (All without proof).

16.3 Solve the problems using the above standard limits

16.4 Evaluate the limits of the type $\lim_{x\to l}\frac{ax^2+bx+c}{\alpha x^2+\beta x+\gamma}$ and $\lim_{x\to\infty}\frac{f(x)}{g(x)}$

16.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

17.0 Appreciate Differentiation and its meaning in engineering situations

17.1 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

17.2 State the significance of derivative in scientific and engineering applications.

17.3 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

17.4 Find the derivatives of simple functions from the first principle .

17.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

17.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

(i) $\sqrt{t^2+\frac{2}{t}}$ **(ii)** $x^2 \sin 2x$ **(iii)** $\frac{x}{\sqrt{x^2+1}}$ **(iv)** $\log\left(\sin(\cos x)\right)$.

17.7 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

17.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

17.9 Find the derivatives of hyperbolic functions.

17.10 Explain the procedures for finding the derivatives of implicit function with examples.

17.11 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.

17.12 Explain the concept of finding the higher order derivatives of second and third order with examples.

17.13 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.

17.14 Explain the definition of Homogenous function of degree n

17.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT - V

Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

18.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.

18.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

18.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x) .

18.4 Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

19.0 Understand the Physical Applications of Derivatives

19.1 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

19.2 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

20.0 Use Derivatives to find extreme values of functions

20.1 Define the concept of increasing and decreasing functions.

20.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

20.3 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima.

20.4 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

21.0 Use Derivatives to find Errors and Approximations

21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

COURSE CONTENT

Unit-I

Algebra

1. Logarithms :

Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions :

Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

$i)\ \dfrac{f(x)}{(x+a)(x+b)(x+c)}$ $\quad ii)\ \dfrac{f(x)}{(x+a)^2(x+b)(x+c)}$

$iii)\ \dfrac{f(x)}{(x^2+a)(x+b)}$ $\quad iv)\ \dfrac{f(x)}{(x+a)(x^2+b)^2}$

Matrices:

3. Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a

square matrix-Laplace's expansion, properties of determinants. Singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables-Solutions by Cramers's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry:

4.Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.

5. Compound angles: Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.

6. Multiple and sub multiple angles: trigonometric ratios of multiple angles 2A,3A and submultiple angle A/2 with problems.

7. Transformations of products into sums or differences and vice versa simple problems

8. Inverse trigonometric functions : definition, domains and ranges-basic properties-problems.

9. Trigonometric equations: concept of a solution, principal value and general solution of trigonometric equations :

sin x =k , cos x= k, tan x =k.

Solutions of simple quadratic equations, equations involving usage of transformations-problems.

10. Properties and solutions of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- solving a triangle-problems.

11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.

12. Complex Numbers : Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form(Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III

Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of appoint, Circle, definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points and (v) centre and tangent equation - general equation of a circle - finding center, radius: tangent, normal to circle at a point on it.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms - applications of parabola and ellipse to engineering situations.

UNIT-IV

Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.
17. Concept of derivative- definition (first principle)- different notations-derivatives of elementary functions - problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarthmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, subtangent and subnormal to the curve at any point . Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.

20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

Reference Books :

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS
(Common to all Branches)

Subject Title : Engineering Physics
Subject Code : ME -103
Periods per week : 04
Total periods per year : 120

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	12	13	1	1
3.	Kinematics	12	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	10	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	14	13	1	1
11.	Modern Physics	10	03	1	-
	Total:	**120**	**103**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

1.1 Explain the concept of Units
1.2 Define the terms
a) Physical quantity, b) Fundamental physical quantities and c) Derived physical quantities
1.3 Define unit
1.4 Define fundamental units and derived units
1.5 State SI units with symbols
1.6 State Multiples and submultiples in SI system
1.7 State Rules of writing S.I. units
1.8 State advantages of SI units
1.9 Define Dimensions
1.10 Write Dimensional formulae
1.11 Derive dimensional formulae of physical quantities
1.12 List dimensional constants and dimensionless quantities
1.13 State the principle of Homogeneity of Dimensions
1.14 State the applications of Dimensional analysis

1.15 State the limitations of dimensional analysis

2.0 Understand the concept of Elements of Vectors

2.1 Explain the concept of Vectors
2.2 Define Scalar and Vector quantities
2.3 Give examples for scalar and vector quantities
2.4 Represent vectors graphically
2.5 Classify the Vectors
2.6 Resolve the vectors
2.7 Determine the Resultant of a vector by component method
2.8 Represent a vector in space using unit vectors (I, j, k)
2.9 State triangle law of addition of vectors
2.10 State parallelogram law of addition of vectors
2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
2.12 Derive expression for magnitude and direction of resultant of two vectors
2.13 State polygon law of addition of vectors
2.14 Explain subtraction of vectors
2.15 Define Dot product of two vectors with examples (Work done, Power)
2.16 Mention the properties of Dot product
2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
2.18 Mention the properties of Cross product.
2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

3.1 Recapitulate the equations of motion in a straight line
3.2 Define acceleration due to gravity
3.3 Derive expressions for
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of
3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.5 Define projectile motion with examples
3.6 Explain Horizontal projection
3.7 Derive an expression for the path of a projectile in horizontal projection
3.8 Explain oblique projection
3.9 Derive an expression for the path of projectile in oblique projection
3.10 Derive formulae for
a)Horizontal Range, b)Maximum range of a projectile in oblique projection
3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

4.1 Define friction
4.2 Classify the types of friction
4.3 Explain the concept of Normal reaction
4.4 State the laws of friction
4.5 Define coefficients of friction
4.6 Explain the Angle of friction
4.7 Derive an expression for acceleration of a body on a rough horizontal surface
4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
4.9 Define Angle of repose
4.10 Derive an expressions for acceleration of a body on a smooth inclined plane (up

and down)

4.11 Derive an expressions for acceleration of a body on a rough inclined plane (up and down)

4.12 List the Advantages and Disadvantages of friction

4.13 Mention the methods of minimizing friction

4.14 Solve the related numerical problems

5.0 Understand the concept of Work, Power, and Energy

5.1 Define work

5.2 State SI units and dimensional formula for work

5.3 Define power

5.4 State SI units and dimensional formula for power

5.5 Define energy

5.6 State SI units and dimensional formula for energy

5.7 Define potential energy

5.8 Derive the expression for Potential energy with examples

5.9 Define kinetic energy

5.10 Derive the expression for kinetic energy with examples

5.11 State the Work- Energy theorem

5.12 Explain the relation between Kinetic energy and momentum

5.13 State the law of conservation of energy

5.14 Verify the law of conversion of energy in the case of a freely falling body

5.15 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

6.1 Define Simple harmonic motion

6.2 State the conditions of Simple harmonic motion

6.3 Give examples for Simple harmonic motion

6.4 Show that the tip of the projection of a body moving in circular path with uniform speed is SHM

6.5 Derive expression for displacement

6.6 Derive expression for velocity

6.7 Derive expression for acceleration

6.8 Derive expression for Time period and frequency of S H M

6.9 Define phase of S H M

6.10 Derive expression for Time period of simple pendulum

6.11 State the laws of simple pendulum

6.12 State the laws of Seconds pendulum

6.13 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

7.1 Explain the concept of expansion of gases

7.2 Explain Boyle' s law

7.3 State Charles law in terms of absolute temperature

7.4 Define absolute zero temperature

7.5 Explain absolute scale of temperature

7.6 Define ideal gas

7.7 Derive ideal gas equation

7.8 Define gas constant and Universal gas constant

7.9 Explain why universal gas constant is same for all gases

7.10 State SI unit of universal gas constant

7.11 Calculate the value of universal gas constant
7.12 State the gas equation in terms of density
7.13 Distinguish between r and R
7.14 Explain Isothermal process with the help of P-V and T-Ø diagram
7.15 Explain adiabatic process with the help of P-V and T-Ø diagram
7.16 Distinguish between isothermal and adiabatic process
7.17 State first and second laws of thermodynamics
7.18 Define specific heats & molar specific heats of a gas
7.19 Derive the relation $C_p - C_v = R$
7.20 Solve the related numerical problems

8.0 Understand the concept of Sound

8.1 Define the term sound
8.2 Explain longitudinal and transverse wave motion
8.3 Distinguish between musical sound and noise
8.4 Explain noise pollution and state SI unit for noise
8.5 Explain causes of noise pollution
8.6 Explain effects of noise pollution
8.7 Explain methods of minimizing noise pollution
8.8 Explain the phenomenon of beats
8.9 List the applications of beats
8.10 Define Doppler effect
8.11 List the Applications of Doppler effect
8.12 Explain reverberation and reverberation time
8.13 Write Sabine's formula
8.14 Explain echoes
8.15 State conditions of good auditorium
8.16 Solve the related numerical problems

9.0 Understand the properties of matter

9.1 Define the term Elasticity
9.2 Define the terms stress and strain
9.3 State the units and dimensional formulae for stress and strain
9.4 State the Hooke's law
9.5 Define the surface tension
9.6 Explain Surface tension with reference to molecular theory
9.7 Define angle of contact
9.8 Define the capillarity
9.9 Write the formula for surface tension based on capilarity
9.10 Explain the concept of Viscosity
9.11 Provide examples for surface tension and Viscosity
9.12 State Newton's formula for viscous force
9.13 Define co-efficient of viscosity
9.14 Explain the effect of temperature on viscosity of liquids and gases
9.15 State Poiseulle's equation for Co-efficient of viscosity
9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

10.1 Explain the concept of Electricity
10.2 State the Ohm's law

10.3 Explain the Ohm's law
10.4 Define specific resistance, conductance and their units
10.5 State Kichoff's laws
10.6 Explain Kichoff's laws
10.7 Describe Wheatstone's bridge with legible sketch
10.8 Derive expression for balancing condition of Wheatstone's bridge
10.9 Describe Meter Bridge with legible sketch
10.10 Write the formula in Meter Bridge to determine specific resistance
10.11 Explain the concept of magnetism
10.12 State the Coulomb's inverse square law of magnetism
10.13 Define magnetic field and magnetic lines of force
10.14 State the Magnetic induction field strength-units and dimensions
10.15 Derive Magnetic induction field strength at a point on the axial line
10.16 Describe the moment of couple on a bar magnet placed in a uniform magnetic field
10.17 Derive Magnetic induction field strength at a point on the equatorial line
10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

11.1 Explain Photo-electric effect
11.2 Write Einstein's photoelectric equation
11.3 State laws of photoelectric effect
11.4 Explain the Working of photoelectric cell
11.5 List the Applications of photoelectric effect
11.6 Recapitulate refraction of light and its laws
11.7 Define critical angle
11.8 Explain the Total Internal Reflection
11.9 Explain the principle and working of Optical Fiber
11.10 Mention types of optical fibbers
11.11 List the applications of Optical Fiber
11.12 Define super conductor and superconductivity
11.13 List the examples of superconducting materials
11.14 List the applications of superconductors

COURSE CONTENT

1. Units and Dimensions:

Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units- Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Advantages and limitations of Dimensional analysis- - Problems.

2. Elements of Vectors:

Scalars and Vectors –Types of vectors(Proper Vector, Null Vector, Unit Vector, Equal , Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors–Subtraction of vectors- Dot and Cross products of vectors-Problems

3. **Kinematics:**
Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range - problems

4. **Friction:**
Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose- Angle of friction— Motion of a body over a horizontal surface- smooth inclined plane- rough inclined plane- Advantages and disadvantages of friction- Methods of reducing friction – Problems

5. **Work, Power and Energy:**
Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy-Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems

6. **Simple Hormonic Motion:**
Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum- Problems

7. **Heat and Thermodynamics:**
Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between r and R- Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats of a gas - Problems

8. **Sound:**
Sound- Nature of sound- Types of wave motion - usical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Condition of good auditorium- Problems

9. **Properties of matter**
Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law- Definition of surface tension- Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity -Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseulle's equation for Co-efficient of viscosity- The related numerical problems

10. **Electricity & Magnetism:**
Ohm's law and explanation- Specific resistance- Kirchoff's laws- Wheatstone's bridge- Coulomb's inverse square law magnetic field- magnetic lines of force-Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line –problems.

11. Modern Physics;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect- Total internal reflection- fiber optics- -principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- concepts of superconductivity - applications

REFERENCE BOOKS

1. Intermediate physics Volume-I — Deepthi
2. Unified physics Volume 1,2,3 and 4 — Dr.S.L Guptha and Sanjeev Guptha
3. Text book of physics Volume I — Resnick & Holiday
4. Text book of applied physics — Dhanpath Roy
5. Fibre optics — D.A Hill

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	12	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	10	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	14	13	0	1	0	0	1	0
11.	Modern Physics	10	03	1	0	0	0	0	0
	Total:	**120**	**110**	**3**	**5**	**2**	**2**	**5**	**1**

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES
((Common to all Branches)

Subject Title : Engineering Chemistry & Environmental Studies
Subject Code : ME -104
Total periods per year : 120

Blue Print

S.No	Major topic	No of Periods	Weightage of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
A. ENGINEERING CHEMISTRY										
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
B. ENVIRONMENTAL STUDIES		18	16	1	1	0	0	1	0	
	Total	120	110	6	2	2	3	3 1/2	1 1/2	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A. ENGINEERING CHEMISTRY

1.0 Understand the concept of Atomic structure

1.1 Explain the fundamental particles of an atom like electron, proton and neutron etc.,

1.2 Explain the concept of atomic number and mass number

1.3 State the Postulates of Bohr's atomic theory and its limitations

1.4 Explain the concept of Quantum numbers with examples

1.5 Explain 1.Aufbau's principle, 2.Hund's rule and 3.Pauli's exclusion principle with respect to electron stability

1.6 Define Orbital in an atomic structure

1.7 Draw the shapes of s, p and d Orbitals in an atomic structure

1.8 Distinguish between Orbit and Orbital

1.9 Write the electronic configuration of elements up to atomic number 30

1.10 Explain the significance of chemical bonding

1.11 Explain the Postulates of Electronic theory of valance

1.12 Define the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic

1.13 Explain the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic

1.14 Explain bond formation in NaCl and MgO

1.15 List Properties of Ionic compounds

1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method

1.17 List Properties of Covalent compounds

1.18 Explain Metallic bond with Electron sea model theory

1.18 Define the terms 1.Oxidation, 2.Reduction and 3.Oxidation number

1.19 Calculate the Oxidation Number

1.20 Differentiate between Oxidation Number and Valence

2.0 Calculate Molarity, Molality and Normality of given Solution

2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent

2.2 Classify solutions based on physical state and solubility

2.3 Define mole

2.4 Explain, with examples, the 'Mole concept'

2.5 Define the terms 1. Atomic weight, 2. Molecular weight and 3. Equivalent weight

2.6 Calculate Molecular weight and Equivalent weight of given Acids, Bases and Salts

2.7 Define 1.Molarity, 2. Molalty and 3.Normality of solutions

2.8 Explain with examples Normality

2.9 Solve Numerical problems on Mole, Molarity and Normality

3.0 Understand the concepts of Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases

3.2 State the limitations of Arrhenius theory of Acids and Bases

3.3 Explain Bronsted – Lowry theory of acids bases

3.4 State the limitations of Bronsted – Lowry theory of acids bases

3.5 Explain Lewis theory of acids and bases

3.6 State the limitations Lewis theory of acids and bases

3.7 Explain the Ionic product of water

3.8 Define pH and explain Sorenson scale

3.9 Solve the Numerical problems on pH (Strong Acids and Bases)

3.10 Define buffer solution

3.11 Give the at least three examples foe buffer solutions

3.12 State the applications of buffer solution

4. 0 Understand the Principles of Metallurgy

4.1 List at least eight Characteristics of Metals

4.2 Distinguish between Metals and Non Metals

4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4. Flux and 5. Slag

4.4 Describe the methods of concentration of ore like 1.Hand picking,2. Levigation, and 3. Froth

Floatation

4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.

4.6 Explain the purification of Metals by Electrolytic Refining

4.7 Define an Alloy

4.8 Write the Composition of the following alloys:1.Brass, 2.German silver, and Nichrome

4.9 List the uses of following Alloys: Brass, German silver, Nichrome

5.0 Understand the concepts of Electrochemistry

5.1 Define the terms1. conductor, 2. Insulator, 3.Electrolyte and 4.Non – electrolyte

5.2 Distinguish between metallic conduction and Electrolytic conduction

5.3 Explain Arrhenius theory of electrolytic dissociation

5.4 Explain electrolysis by taking example fused NaCl

5.5 Explain Faraday's laws of electrolysis

5.6 Define 1.Chemical equivalent and 2.Electrochemical equivalent

5.7 Solve the Numerical problems based on Faraday's laws of electrolysis

5.8 Define Galvanic cell

5.9 Explain the construction and working of Galvanic cell

5.10 Distinguish between electrolytic cell and galvanic cell

5.11 Explain the standard electrode potentials

5.12 Explain the electrochemical series and its significance

5.13 Explain the emf of a cell

5.14 Solve the numerical problems on emf of cell

6.0 Understand the concept of Corrosion

6.1 Define the term corrosion

6.2 Explain the Factors influencing the rate of corrosion

6.3 Explain the concept of electrochemical theory of corrosion

6.4 Describe the formation of a) composition cells, b) stress cells c) concentration cells

6.5 Explain the mechanism of rusting of iron

6.6 Explain the methods of prevention of corrosion: a) Protective coatings

b) Cathodic protection (Sacrificial anode process and Impressed – voltage process)

7. 0 Understand the concept of Water Technology

7.1 State the various Sources of water like Surface and sub surface sources

7.2 Define the terms soft water and hard water with respect to soap consumption

7.3 Define the term of hardness of water

7.4 Explain the various types of hardness of water like temporary and permanent hardness; and carbonate and bicarbonate hardness of water.

7.5 List the usual compounds causing hardness (with Formulae)

7.6 State the disadvantages of using hard water in industries

7.7 Define Degree of hardness, units of hardness (mg/L)

7.8 Explain the methods of softening of hard water: a) Ion-Exchange process, b)Reverse osmosis process(RO)

7.9 List the advantages of RO

7.10 State three essential qualities of drinking water like

1).Safety, 2). Economy and 3)..Aesthetic

8.0 Understand the concepts of Polymers

8.1 Explain the concept of polymerisation

8.2 Describe the methods of polymerisation a) addition polymerisation of Ethylene b) condensation polymerisation of phenol and formaldehyde (Only flow chart i.e. without chemical equations)

8.3 Define the term plastic

8.4 Classify the plastics with examples

8.5 Distinguish between thermo and thermosetting plastics

8.6 List the Characteristics of plastics

8.7 State the advantages of plastics over traditional materials

8.8 State the disadvantages of using plastics.

8.9 Explain the methods of preparation of the following plastics:

1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde

8.9 Explain the uses of the following plastics:

1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde

8.10 Define the term natural rubber

8.11 State the structural formula of Natural rubber

8.12 Explain the processing of Natural rubber from latex

8.13 List the Characteristics of natural rubber

8.14 Explain the process of Vulcanization

8.15 List the Characteristics of Vulcanized rubber

8.16 Define the term Elastomer

8.17 Describe the preparation of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber

8.18 List the uses of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber

9.0 Understand the concepts of Fuels

9.1 Define the term fuel

9.2 Classify the fuels based on physical state – solid, liquid and gaseous fuels,

9.3 Classify the fuels based on occurrence- primary and secondary fuels

9.4 List the characteristics of good fuel

9.5 State the composition and uses of gaseous fuels:
a) water gas, b) producer gas, c) natural gas, d) coal gas, e) Bio gas and f) acetylene

B. ENVIRONMENTAL STUDIES

1.1 Define the term environment

1.2 Explain the scope and importance of environmental studies

1.3 Explain the following terms 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere, 5)Pollutant, 6).Pollution, 7).Contaminant receptor - sink, particulates, dissolved oxygen, 8).Threshold limit value, 9).BOD, and 10).COD

1.4 Explain the growing energy needs

1.5 State the differences between renewable and non renewable energy sources- alternative energy sources.

1.6 Define an Ecosystem- biotic component, abiotic component and energy component,

1.7 Define the terms:
1). Producers, 2). Consumers and 3). Decomposers with examples.

1.8 Explain biodiversity and threats to biodiversity

1.9 Define air pollution

1.10 Classify the air pollutants- based on origin and state of matter

1.11 Explain the causes of air pollution

1.12 Explain the use and over exploitation of forest resources and deforestation

1.13 Explain the effects of air pollution on human beings, plants and animals

1.14 Explain the green house effect - ozone layer depletion and acid rain

1.15 Explain the methods of control of air pollution

1.16 Define water pollution

1.17 Explain the causes of water pollution

1.18 Explain the effects of water pollution on living and non living things

1.19 Understand the methods of control of water pollution.

COURSE CONTENT

A. ENGINEERING CHEMISTRY

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers - Aufbau principle - Hand's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds
– Metallic bond

Oxidation-Reduction: Concepts of Oxidation-Reduction, Oxidation Number-calculations, differences between Oxidation Number and Valency

2. Solutions

Introduction-concentration methods – Mole concept, Molarity, Normality, Equivalent weights, Numerical problems on Mole, Molarity and Normality

3. Acids and Bases

Introduction – theories of acids and bases and limitations – Arrhenius theory-Bronsted –Lowry theory – Lewis acid base theory – Ionic product of water – pH and related numerical problems – buffer solutions –Applications.

4. Principles of Metallurgy

Characteristics of Metals and distinctions between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. Electrochemistry

Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series –emf and numerical problems on emf of a cell

6. Water technology

Introduction –soft and hard water – causes of hardness – types of hardness
–disadvantages of hard water – degree of hardness (ppm) – softening methods – permutit process – ion exchange process – numerical problems related to degree of hardness – drinking water – municipal treatment of water for drinking purpose – Osmosis, Reverse Osmosis - advantages of Reverse osmosis

7. Corrosion

Introduction - factors influencing corrosion - electrochemical theory of corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics – preparation and uses of the following plastics: 1. Polytehene 2. PVC 3. Teflon 4. Polystyrene 5. Urea formaldehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers – Butyl rubber, Buna-s, Neoprene rubber and their uses.

9. Fuels

Definition and classification of fuels – characteristics of good fuel - composition and uses of gaseous fuels.

B. ENVIRONMENTAL STUDIES

Introduction – environment –scope and importance of environmental studies important terms – renewable and non renewable energy sources – Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Biodiversity.

air pollution - causes-Effects – forest resources : uses and over exploitation, deforestation, acid rain, green house effect –ozone depletion – control of air pollution – Water pollution – causes – effects – control measures,

REFERENCE BOOKS

1.	Intermediate chemistry Vol 1&2	Telugu Acedemy
2.	Intermediate chemistry Vol 1&2	Vikram Publishers
3.	Intermediate chemistry Vol 1&2	Vignan Publishers & Deepthi Publishers
4.	Engineering Chemistry	Jain & Jain
5.	Engineering Chemistry	O.P. Agarwal, Hi-Tech.
6.	Engineering Chemistry	Sharma
7.	Engineering Chemistry	A.K. De

ENGINEERING MECHANICS

Subject Title : Engineering Mechanics
Subject Code : ME-105
Periods/Week : 04
Periods per year : 120

TIME SCHEDULE

S No.	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Statics	22	21	02	1 ½
2	Friction	18	16	02	01
3	Geometrical properties of sections	22	18	01	1 ½
4	Dynamics	28	26	02	02
5	Simple machines	20	21	02	1 ½
6	Basic Link Mechanisms	10	08	01	½
	Total	**120**	**110**	**10**	**08**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Statics

1.1 Explain the meaning of mechanics in engineering.
1.2 State the importance of mechanics in engineering.
1.3 Review the system of units used.
1.4 Explain the concept of force
1.5 List the types of forces
1.6 Explain the force system
a) Co-planar and Non-Coplanar,
b) Parallel and Non-Parallel,
c) Like and Un like, d) Concurrent and Non-concurrent
1.7 Explain the concept of equilibrium
1.8 State the parallelogram law of forces
1.9 State the triangle law of forces
1.10 State the polygon law of forces
1.11 State the Lami's theorem.
1.12 Explain the concept of free body diagram
1.13 Solve the problems involving concurrent coplanar forces
1.14 Solve simple problems involving non-concurrent coplanar forces
1.15 Solve simple problems using Lami's theorem
1.16 Define the term couple and moment of couple with legible sketch.
1.17 Explain the properties of a couple
1.18 State the condition of equilibrium of a body acted upon by co-planar forces.

2.0 Understand the concept of Friction

2.1 Explain the concept of friction
2.2 State the laws of friction
2.3 Identify the machine members in which friction exists and desirable
2.4 Resolve the forces acting on bodies moving on horizontal plane.
2.5 Resolve the forces acting on bodies moving along the inclined planes.
2.6 Solve the related numerical problems

3.0 Understand the Geometric Properties of Sections

3.1 Define the terms Centre of Gravity, Centre of Mass and Centroid.
3.2 State the need for finding the Centroid and Centre of gravity for various engineering applications
3.3 Locate the C.G. of a given section.
3.4 Explain the method of determining the Centroid by 'Method of moments'
3.5 Determine the position of Centroid of standard sections-T, L, I, Channel section, Z section, unsymmetrical I section
3.6 Determine the position of Centroid of built up sections consisting of RSJ'S and flange plates and Plane figures having hollow portions
3.7 Explain the meaning of the term moment of Inertia.
3.8 Define the term polar moment of inertia
3.9 Explain the term radius of gyration
3.10 State the necessity of finding Moment of Inertia for various engineering applications
3.11 Determine Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section, unsymmetrical I section
3.12 State Parallel axis theorem and perpendicular axis theorem
3.13 Determine MI of standard sections by applying parallel axes theorem
3.14 Determine MI of standard sections by applying parallel axes theorem
3.15 Calculate the moment of Inertia of composite sections.
3.16 Calculate radius of gyration of standard sections.
3.17 Determine the polar M.I for solid and hollow circular section applying perpendicular axes theorem.
3.18 Solve the related numerical problems

4.0 Understand the concept of Dynamics

4.1 Define the terms Kinematics and Kinetics
4.2 Classify the motion types
4.3 Define the terms displacement, velocity and acceleration
4.4 State the Newton's Laws of motion (without derivation)
4.5 Solve the problems related to the rectilinear motion of a particle
4.6 Explain the Motion of projectile
4.7 Solve the numerical problems
4.8 State the D'Alembert's principle
4.9 Define the Law of conservation of energy
4.10 Explain the Work-Energy principle
4.11 Define the Law of conservation of momentum
4.12 Explain the Impulse –momentum equation
4.13 Solve the problems using the above principles
4.14 Explain the Rotary motion of particle
4.15 Define Centripetal force.
4.16 Define Centrifugal force.

4.17 Differentiate Centripetal and Centrifugal forces
4.18 Describe simple harmonic motion.
4.19 Explain the application of simple harmonic motion in engineering.

5.0 Comprehend the Principles involved in Simple Machines

5.1 Define the important terms of simple machines
a) Machine, b) Mechanical Advantage, c) Velocity Ratio, d) Efficiency.
5.2 Illustrate the use of three classes of simple lever.
5.3 Show that an inclined plane is a simple machine to reduce the effort in lifting loads.
5.4 Derive expression for VR in cases of wheel & axle, Weston Differential pulley blocks, pulleys, Worm & Worm wheel crabs, screw jack, rack & pinion.
5.5 Compute the efficiency of a given machine.
5.6 Compute effort required to raise or lower the load under given conditions.
5.7 Interpret the law of machine.
5.8 State the conditions for self-locking and reversibility.
5.9 Calculate effort lost in friction and load equivalent of friction.
5.10 Evaluate the conditions for maximum M.A.& Maximum efficiency.

6.0 Understand the concept of Basic Link mechanism

6.1 Define important terms of Basic link mechanism
a) Link, b) kinematics pair, c) Kinematic chain, d) Mechanism & machine
6.2 Explain kinematic pair and kinematic chain with the help of legible sketch
6.2 List examples for Lower and Higher pairs.
6.3 List examples of inversion.

COURSE CONTENT

1.0 Statics

1.1 The meaning of word mechanics.
1.2 Application of Mechanics to Engineering.
1.3 System of Units.
1.4 Definition and specification of force
1.5 System of forces
1.6 Resolution of force
1.7 Equilibrium and Equilibrant.
1.8 Statement of Parallelogram law of forces, triangle law of forces, polygon law of forces and Lami's theorem
1.9 Drawing the free body diagram
1.10 Numerical problems related to concurrent coplanar forces
1.11 Couple and moment of a couple
1.12 Condition for equilibrium of a rigid body subjected to number of coplanar non-concurrent forces.
1.13 Related Numerical problems

2.0 Friction

2.1 Definition of static friction, dynamic friction and impending friction
2.2 laws of solid and liquid friction
2.3 Derivation of limiting angle of friction and angle of repose
2.4 Resolution of Forces considering Friction when a body moves on horizontal plane.

2.5 Resolution of Forces considering Friction when a body moves on inclined plane.
2.6 Numerical examples on the above cases

3.0 Geometric Properties of Sections

3.1 Definition and explanation of the terms Centre of Gravity, Centre of Mass and centroid
3.2 Centroid of square, rectangle, triangle, semi-circle and trapezium (formulae only without derivations)
3.3 Centre of gravity of composite sections by analytical method `only (T-Section, L-Section I-section and channel section).
3.4 Moment of Inertia.
a) Definition and Explanation, b) Theorems of Moment of Inertia.
`i) Parallel axes theorem, ii) Perpendicular axes theorem.
c) Moment of Inertia for simple Geometrical Sections, Rectangular, circular and triangular section and Radius of Gyration.
3.5 Calculation of Moment of Inertia and Radius of Gyration of
a) I – Section, b) Channel Section, c) T – Section.
d) L – Section (Equal & unequal lengths), e) Z - section
f) Built up Sections (Simple cases only)

4.0 Dynamics

4.1 Defination of Kinematics and Kinetics
4.2 Classification of motion
4.3 Defination of displacement, velocity and acceleration
4.4 Laws of motion (without derivation)
4.5 Solving the problems related to the rectilinear motion of a particle
4.6 Motion of projectile and solving the numerical problems
4.7 Newton's laws of motion.
4.8 D'Alembert's principle
4.9 Defination Law of conservation of energy
4.10 Work-Energy principle
4.11 Law of conservation of momentum
4.12 Impulse –momentum equation
4.13 Solving the kinetic problems using the above principles
4.14 Rotary motion of particle and laws of motion
4.15 Definition and Differentiate Centripetal and Centrifugal forces.
4.16 Simple harmonic motion.
4.17 Definition of the terms frequency, time period, amplitude and circular frequency
4.18 SHM equation, natural frequency
4.19 Simple problems on SHM

5.0 Simple Machines

5.1 Definition of Simple machine, and uses of simple machine, levers and inclined plane.
5.2 Fundamental terms like mechanical advantage, velocity ratio and efficiency.
5.3 Expressions for VR in case of Simple/Differential pulley/pulleys of 3 systems, Worms and Worm wheel, Rack and pinion, Winch crabs, &Screw jack.
5.4 Conditions for reversibility and self locking.
5.5 Law of Simple Machine.
5.6 Effort lost in friction, Load Equivalent of Friction Max. M.A. and Max. efficiency.

6.0 Basic Link Mechanism

6.1 Definition of terms: link, kinematic pair, kinematic chain, Mechanism, structure and machine.

6.2 Quadric cycle chain and its inversions.

6.3 Slider Crank chain and its inversion.

REFERENCE BOOKS:

1	Engineering Mechanics	by	Singer	B.S.Publications
2	Engineering Mechanics	by	Basudeb Bhattacharya – Oxford Publishers	
3	Engineering Mechanics	by	A Nelson	Mc Graw Hill Publishers
4	Engineering Mechanics	by	I.B.Prasad	
5	Engineering Mechanics	by	R.S.Khurmi	S.Chand & Comp
6	Theory of Machines	by	S.S.Rathan	TMH P

WORKSHOP TECHNOLOGY

Subject Title : Workshop Technology
Subject Code : ME-106
Periods per Week : 04
Periods per Year : 120

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Basic Workshop tools & operations				
	(1) Carpentry	20	16	2	1
	(2) Fitting	25	26	2	2
	(3) Forging	15	13	1	1
	(4) Sheet metal	12	13	1	1
2	Drilling	10	13	1	1
3	Foundry	22	16	2	1
4	Mechanical working of metals	16	13	1	1
	Total	120	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Comprehend the use of Basic workshop tools and its operation

a. State the importance of workshop processes.
b. List the various workshop processes and explain briefly about each.

1.1 Carpentry

a. Identify various carpentry tools.
b. Distinguish between marking tools, measuring tools and cutting tools.
c. List work holding devices.
d. Explain wood working processes viz., sawing, chiselling and planning.
e. Explain the use of carpentry joints such as lap joint, dovetail joint, mortise and tenon joint with legible sketch
f. Explain the working of wood working machines.

1.2 Fitting

a. List various fitting tools.
b. Distinguish between marking and measuring tools.
c. List cutting tools.
d. List various work holding devices.
e. List various checking and measuring instruments.
f. Explain fitting operations such as marking, sawing, chipping, filing, grinding, drilling and tapping with legible sketch

1.3 Forging

a. List various tools used in black-smithy.
b. List equipment used in a forging shop.
c. Explain the important smithy operations
d. Explain the working principle of machine forging
e. Explain machine forgoing operations such as upsetting, drawing down and punching with legible sketch
f. Explain the working principle of forging press with legible sketch.
g. List the forging defects

1.4 Sheet Metal

a. List various marking tools in sheet metal work
b. List various stakes
c. List various measuring tools used in sheet metal work
d. List various sheet metal joints.
e. Describe sheet metal operations such as shearing, bending drawing and squeezing
f. Differentiate between riveting, soldering & brazing

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2.0 Understand the concept of drilling

2.1 State the working principle of drilling.
2.2 List out different types of drilling machines.
2.3 Draw the line diagrams of the sensitive and radial drilling machines.
2.4 Identify the parts of these machines.
2.5 Describe the functions of each part.
2.6 Write the Specications of drilling machines.
2.7 Write the nomenclature of the drill bit.
2.8 Write the geometry of twist drill.
2.9 List the functions of twist drill elements.
2.10 List the different operations on drilling machine.

3.0 Understand the concept of Foundry

3.1 Acquaint with foundry as a manufacturing process.
3.2 State the advantages of casting over other process.
3.3 State the limitations of the process.
3.4 List the various hand moulding tools.
3.5 State the properties of good moulding sand.
3.6 State the types of moulding sands.
3.7 List the ingredients in foundry sand.
3.8 List the various types of patterns.
3.9 State the sequence of pattern making operations.
3.10 Identify the colour codes.
3.11 List the various moulding processes.
3.12 State the need and types of cores.
3.13 Describe the casting processes.
3.14 Identify the defects in casting.
3.15 Describe special casting processes.

4.0 Mechanical working of metals

4.1 Define mechanical working of metals.
4.2 Differentiate cold working with hot working.

4.3 Illustrate the working principle of hot rolling, piercing, spinning, extrusion and drawing.
4.4 State advantages and limitations of hot working.
4.5 Identify various cold working processes such as rolling, bending and squeezing.
4.6 State advantages and limitations of cold working.

COURSE CONTENT

1 **Introduction**

Methods of manufacturing processes - casting, forming, metal removal processes, joining processes, surface finishing processes, basic workshop processes - carpentry, fitting, hand forging, machine forging, sheet metal work, cold and hot working of metals.

1.1 **Carpentry**

1.1.1 **Marking & measuring tools**: scales, rules, fourfold wooden rule, flexible measuring rule (tape), straight edge, try square, bevel square, combination square, marking knife, marking gauge, mortise gauge, cutting gauge, wing compass, trammel, divider, outside calliper, inside calliper, odd leg calliper, spirit level, plum bob, specifications- uses.

1.1.2 **Cutting Tools**

Saws: ripsaw, cross cut saw (hand saw), panel saw, tenon or back saw, dovetail saw, bow saw, coping saw, compass saw, pad or keyhole saw, specifications & uses.

Chisels: Firmer chisel, bevelled edge firmer chisel, parting chisel, mortise chisel, inside and outside gauges, specifications and uses.

Planes: Jack plane (wooden jack plane, metal jack plane), rough plane, smoothing plane, rebate plane, plough plane, router, spoke shave, special planes and their specifications and uses.

Boring Tools:

Gimlet, braces- wheel brace, ratchet brace, bit-shell bit, twist bit (auger bit), expansive bit, centre bit, router bit, countersink bit, drill, reamer their specifications & uses.

1.1.2 **Striking tools:**

Hammers - Warrington hammer, claw hammer, mallet, specifications &uses.

1.1.3 **Holding devices**

Bench vice, bench stop, bench hold fast, sash cramp (bar cramp) G- cramp, Hand screw, specifications & uses.

1.1.4 **Miscellaneous tools**

Rasps and files, scraper, oilstone, glass paper, pincer, screw driver, cabinet screw driver, ratchet-screw driver, saw set, oil stone slip. specifications and uses.

1.1.5 **Carpentry Processes**

Marking, measuring, sawing,chiselling,planning,boring,grooving, rebating & moulding.

1.1.6 **Carpentry joints**

Halving Joint, mortise and tenon joint, bridle joint, butt joint.

dowel joint, tongue & groove joint, screw & slot joint, dovetail joint, corner joint.

1.1.7 **Wood working machines**

Wood working lathe (wood turning lathe), circular saw, band saw, wood planer, sanding machine, belt sander, spindle sander, disc sander and grinder, specifications and uses.

1.2 **Fitting**

1.2.1 **Cutting tools**

Chisels: Flat chisel, cross cut chisel, half round chisel, diamond point chisel, side chisel, specifications and uses.

Files: Different parts of a file – sizes and shapes - flat file, hand file, square file ,piller file ,round file, triangular file, half round files, knife edge file, needle file – specifications and uses.

Scrapers: Flat, triangular, half round scrapers, specifications & uses.

Saws: Hand hacksaw - solid frame, adjustable frame, specifications & uses, hand hacksaw blades. Power hack saw –description(horizontal reciprocating type), power hacksaw blade, specifications and uses, teeth set - saw material.

Drill bits: Flat drill, straight fluted drill, twist drill, parallel shank, tapered shank, specifications & uses.

Reamer: Hand reamer, machine reamer, straight and spiral flutes reamers, specifications and uses.

Taps: Hand taps - taper tap, plug tap and bottoming tap, specifications and uses.

Dies & Sockets: Dies- solid, adjustable - specifications and uses.

1.2.2 **Striking Tools**

Hammers: Parts, ball peen, cross peen, straight peen hammers, soft hammer, sizes, specifications and uses.

1.2.3 **Holding Devices**

Vices: Bench vice, leg-vice, hand vice, pin vice, tool maker's vice, pipe vice, care of vices, specifications and uses.

1.2.4 **Marking Tools**

Surface plate, V-block, angle plate, try square, scriber, punch, prick punch, centre punch, number punch, letter punch, specifications and uses.

1.2.5 **Miscellaneous Tools**

Screw drivers, spanners, single ended & double ended, box type, adjustable spanners, cutting pliers, nose pliers, allen keys, specifications and uses.

1.2.6 **Checking and measuring instruments**

Checking instruments.

Callipers: Outside&Inside callipers, hermaphrodite (odd leg) calliper with firm joint, spring callipers, transfer calliper sizes & uses, dividers - sizes & uses.

Measuring instruments:
Combination square, bevel protractor, universal bevel protractor, sine bar, universal surface gauge, engineer's parallels, slip gauges, plane gauge, feeler gauge, angle gauge, radius & template gauge, screw pitch gauge, telescopic gauges, plate & wire gauge, ring and plug gauges, snap gauges specifications & uses, vernier callipers, vernier height gauge, vernier depth gauge, micrometer - outside & inside, stick micrometer, depth micrometer, vernier micrometer, screw thread micrometer specifications and uses.

1.2.7 **Fitting Operations**
Marking, sawing, chipping, filing, scrapping, grinding, drilling, reaming, tapping and dieing.

1.3 Forging

1.3.1 **Hand forging tools:** Anvil, swage block, hand hammers - types; sledge hammer, specifications and uses, tongs - types, specifications & uses, chisel - hot & cold chisels specifications & uses. swages - types and sizes, fullers, flatters, set hammer, punch and drift - sizes and uses.

1.3.2 **Equipment:** Open and closed hearth heating furnaces, hand and power driven blowers, open and stock fire, fuels-charcoal, coal, oil gaseous fuels.

1.3.3 **Smith Operations:** Upsetting, drawing down, setting down, punching, drifting, bending, welding, cutting, swaging, fullering and flattering.

1.3.4 **Machine Forging:** Need of machine forging, forging hammers - spring hammer, pneumatic hammer, drop hammer, forging press, hydraulic press - line diagram, machine forging operations - drawing, upsetting, punching, tools used in machine forging.

1.3.5 **Forging defects:** Types and remedies.

1.4 Sheet Metal Work

1.4.1 Metals used for sheet metal work.

1.4.2 **Sheet metal hand tools**:
Measuring tools - steel rule, circumference rule, thickness gauge, sheet metal gauge, straight edge, scriber, divider, trammel points, punches, chisels, hammers, snips or shears, straight snip, double cutting shear, squaring shear, circular shear, bench & block shears.
Stakes: Double seaming stake, beak horn stake, bevel edged square stake, Hatches stake, needle stake, blow Horn stake, hollow mandrel stake, pliers (flat nose and round nose), grocers and rivet sets, soldering iron, specifications & uses.

1.4.3 **Sheet Metal Operations**
Shearing: Cutting off, parting, blanking, punching, piercing, notching, slitting, lancing, nibbling and trimming.
Bending: Single bend, double bend, straight flange, edge hem, Embossing, beading, double hem or lock seam.
Drawing: Deep drawing, shallow or box drawing.
Squeezing: Sizing, coining, hobbing, ironing, riveting.

1.4.4 **Sheet Metal Joints**

Hem Joint: single hem, double hem & wired edge, seam joint -lap seam, grooved seam, single seam, double seam, dovetail seam, burred bottom seam or flanged seam.

1.4.5 **Fastening Methods**

Rivetting, soldering, brazing & spot welding.

2 **Drilling**

2.1 **Type of drilling machines:** sensitive & radial and their constructional detail and specifications.

2.2 **Drill bits**: Terminology - geometry of twist drill - functions of drill elements.

2.3 **Operations:** Drilling, reaming, boring, counter boring, counter sinking, tapping, spot facing and trepanning.

3 **Foundry.**

3.1 **Introduction:** Development of foundry as a manufacturing process, advantages and limitations of casting over other manufacturing processes.

3.2 **Foundry equipment:**

Hand moulding tools: shovel, riddle, rammers, trowels, slicks, lifter, strike - off bar, spruepin bellow, swab, gate cutter, mallet, vent rod, draw spike, rapping plate or lifting plate, pouring weight, gagger, clamps, spirit level, moulding boxes, snap box & flash box.

3.3 **Sands:** Properties of moulding sand - porosity, flowability, collapsibility, adhesiveness, cohesiveness and refractoriness.

3.4 **Types of moulding sand** : green sand, dry sand, loam sand, facing sand, backing sand, parting sand, core sand, system sand their ingredients and uses.

3.5 **Pattern making:** Materials such as wood, cast Iron, aluminium, brass, plastics their uses and relative advantages, classification of patterns such as solid (one piece), two piece and three pieces, split patterns, gate patterns and shell patterns, sequence in pattern making, pattern allowances and colour codes.

3.6 **Cores:** Need of cores, types of cores.

3.7 Casting: green sand and dry sand moulding, cement bonded moulding, shell moulding, ceramic moulding, defects in castings and their remedies.

3.8 Special casting processes: (Principles and applications only) die casting – hot chamber and cold chamber, centrifugal casting, CO_2 process, investment casting

4 **Mechanical working of metals**

4.1 **Introduction:** Hot working and cold working

4.2 **Hot working processes:** rolling - types of rolling, two high mill, three high mills, four high mills, piercing or seamless tubing, drawing or cupping, spinning, extrusion - direct or forward extrusion, indirect or backward extrusion, tube extrusion, Impact extrusion.

4.3 Effects of hot working of metals**,** advantages & limitations of hot working of metals.

4.4 **Cold working process:**

Rolling, drawing - wire drawing, tube drawing, bending, roll forming, angle bending, spinning, extrusion, squeezing, cold heading, thread rolling, peening.

4.5 Effects of cold working of metals, advantages & limitations of cold working.

REFERENCE BOOKS

1.	Production Technology	by	Jain & Gupta (Khanna Publiahers)
2.	Elementary Workshop Technology	by	Hazra Chowdary & Bhattacharya (Media Promotors)
3.	Manufacturing Technology (Vol I)	by	P N Rao (Mc Graw Hill)
3.	Workshop Technology Vol I & II	by	Raghuvamshi

ENGINEERING DRAWING

Subject Title : Engineering Drawing
Subject Code : ME–107
Periods/Week : 06
Periods Per Year : 180

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	--	01	-	-	-
2	Engineering Drawing Instruments	01	05	-	-	-
3	Free hand lettering & Numbering	01	06	5	1	-
4	Dimensioning Practice	01	09	5	1	-
5	Geometrical constructions	03	21	15	1	1
6	Projection of points, Lines, Planes & Solids	03	21	10	-	1
7	Auxiliary views	01	06	5	1	-
8	Sectional views	01	27	10	-	1
9	Orthographic Projection	01	33	10	-	1
10	Pictorial drawing	01	30	10	-	1
11	Development of surfaces	01	21	10	-	1
Total		**14**	**180**	**80**	**04**	**06**

The Course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Pre-Requisite: Clear visualization and sound pictorial intelligence

OBJECTIVES
Upon completion of the subject the student shall be able to

1.0 Understand the basic concepts of Engineering Drawing

1.1 State the importance of drawing as an engineering communication medium
1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.
1.3 Explain the linkages between Engineering drawing and other subjects of study in diploma course.

2.0 Use of Engineering Drawing Instruments

2.1 Select the correct instruments and draw lines of different orientation.
2.2 Select the correct instruments and draw small and large Circles.
2.3 Select the correct instruments for measuring distances on the drawing.
2.4 Use correct grade of pencil for different types of lines, thickness and given function.
2.5 Select and use appropriate scales for a given application.
2.6 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.
2.7 Prepare Title block as per B.I.S. Specifications.
2.8 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having two exercises)

3.0 Write Free Hand Lettering and Numbers

3.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height
3.2 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height
3.3 Select suitable sizes of lettering for different layouts and applications
3.4 Practice the use of lettering stencils.

Drawing plate 2: (Having 5 to 6 exercises)

4.0 Understand Dimensioning Practice

4.1 Define "Dimensioning.
4.2 State the need of dimensioning the drawing according to accepted standard.
4.3 Identify notations of Dimensioning used in dimensioned drawing.
4.4 Identify the system of placement of dimensions in the given dimensioned drawing.
4.5 Dimension a given drawing using standard notations and desired system of dimensioning.
4.6 Dimension standard features applying necessary rules.
4.7 Arrange dimensions in a desired method given in a drawing.
4.8 Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

Drawing Plate 3: (Having 08 to10 exercises)

5.0 Apply Principles of Geometric Constructions

5.1 Divide a given line into desired number of equal parts internally.
5.2 Draw tangent lines and arcs.
5.3 Use General method to construct any polygon.
5.4 Explain the importance of conics
5.5 Construct conics (ellipse, parabola and hyperbola) by general method
5.6 Construct ellipse by concentric circles method
5.7 Construct parabola by rectangle method
5.8 Construct rectangular hyperbola from the given data.
5.9 Construct involute from the given data.
5.10 Construct cycloid and helix from the given data.
5.11 State the applications of the above constructions in engineering practice.

Drawing Plate -4: Having problems up to construction of polygon
Drawing Plate -5: Having problems of construction of conics
Drawing Plate -6: Having problems of construction of involute, cycloid and helix

6.0 Apply Principles of Projection of points, lines, planes & solids

6.1 Visualize the objects
6.2 Explain the I-angle and III-angle projections
6.2 Practice the I-angle projections
6.3 Draw the projection of a point with respect to reference planes (HP&VP)
6.4 Draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)
6.5 Draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)
6.6 Draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)

Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)
Drawing Plate -8: Having problems of projection of planes (6 exercises)
Drawing Plate -9: Having problems of projection of solids (10 exercises)

7.0 Understand the need of auxiliary views

7.1 State the need of Auxiliary views for a given engineering drawing.
7.2 Draw the auxiliary views of a given engineering component
7.3 Differentiate between auxiliary view and apparent view

Drawing plate No.10: (Having 4 exercises)

8.0 Appreciate the need of Sectional Views

8.1 Explain the need to draw sectional views.
8.2 Select the section plane for a given component to reveal maximum information.
8.3 Explain the positions of section plane with reference planes
8.4 Differentiate between true shape and apparent shape of section
8.5 Draw sectional views and true sections of regular solids discussed in **6.0**
8.6 Apply principles of hatching.

Drawing Plate–11: Having problems of section of solids (6 exercises)

9.0 Apply principles of orthographic projection

9.1 Explain the principles of orthographic projection with simple sketches.
9.2 Draw the orthographic view of an object from its pictorial drawing.
9.3 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate 12 : (Having 10 to 12 exercises)

10.0 Prepare pictorial drawings

10.1 State the need of pictorial drawings.
10.2 Differentiate between isometric scale and true scale.
10.3 Prepare Isometric views for the given orthographic drawings.

Drawing plate 13: (Having 10 to 12 exercises)

11.0 Interpret Development of surfaces of different solids

11.1 State the need for preparing development drawing.

11.2 Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method.

11.3 Prepare development of surface of engineering components like trays, funnel, 90^0 elbow & rectangular duct.

Drawing plate No. 14: (Having 05 exercises)

Competencies and Key competencies to be achieved by the student

S.No	Major topic	Key Competency
1.	Importance of Engineering Drawing	• Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	• Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	• Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	• Dimension a given drawing using standard notations and desired system of dimensioning
5.	Geometrical construction	• Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	• Draw the projection of a point, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Auxiliary views	• Draw the auxiliary views of a given Engineering component • Differentiate between Auxiliary view and apparent view
8.	Sectional views	• Differentiate between true shape and apparent shape of section • Use conventional representation of Engineering materials as per B.I.S. Code. • Apply principles of hatching. • Draw simple sections of regular solids
9.	Orthographic Projection	• Draw the minimum number of views needed to represent a given object fully.
10.	Pictorial drawing	• Differentiate between isometric scale and true scale. • Draw the isometric views of given objects,.
11.	Development of surfaces	• Prepare development of Surface of Engineering components like trays, funnel, 90^0 elbow & rectangular duct.

COURSE CONTENT

NOTE

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet, Drawing plate:

Lay out of sheet – as per SP-46-1988 to a suitable scale.

Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering
Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm)
Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing - Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features "Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in engineering application.
Construction of tangent lines: to draw tangent lines touching circles internally and externally.
Construction of tangent arcs

i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).
ii)Tangent arc of given radius touching a circle or an arc and a given line.
iii)Tangent arcs of radius R, touching two given circles internally and externally.

Construction of polygon:construction of any regular polygon of given side length using general method
Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. application viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process,
Construction of any conic section of given eccentricity by general method
Construction of ellipse by concentric circles method
Construction of parabola by rectangle method
Construction of rectangular hyperbola
General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz, Gear tooth profile, screw threads, springs etc. - their construction

6.0 Projection of points, lines and planes & solids

Projecting a point on two planes of projection -Projecting a point on three planes of projection -Projection of straight line.
(a) Parallel to both the planes.
(b) Perpendicular to one of the planes.
(c) inclined to one plane and parallel to other planes
Projection of regular planes
(a) Plane perpendicular to HP and parallel to VP and vice versa.
(c) Plane perpendicular to HP and inclined to VP and vice versa.

Projection of regular solids
(a) Axis perpendicular to one of the planes
(b) Axis parallel to VP and inclined to HP and vice versa.

7.0 Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

8.0 Sectional views

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object -Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work -Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramid (sketches only) -Types of development: Parallel line and radial line development -Procedure of drawing development, drawings of trays, funnels, 90^0 elbow pipes and rectangular ducts.

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)
Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)
Engineering Drawing by N.D.Bhatt.
T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.
SP-46-1998 – Bureau of Indian Standards.

BASIC WORKSHOP PRACTICE

Subject Title : Workshop Practice
Subject Code : ME -108
Periods/Week : 06
Periods Per Year : 180

TIME SCHEDULE

S.No	Major Title	No of Periods
1.	Fitting shop	36
2.	Forging shop	39
3.	Carpentry shop	51
4.	Sheet metal work	51
	Test	03
	Total	180

OBJECTIVES

Upon completion of the course the student shall be able to

- **Practice the required operations in Fitting Shop**
- **Practice the required operations in Forging Shop**
- **Practice the required operations in Carpentry Shop**
- **Practice the required operations in Sheet metal Shop**

Competencies and Key competencies to be achieved by the student.

Title of the Job	Competencies	Key Competencies
Fitting shop 1.Marking and Chipping on Mild steel flat of 12 mm thick (12)	– Identify appropriate measuring tool – Handle appropriate marking tool – Handle appropriate chipping tool – Mark the dimensions – Remove the material by chipping from MS flats	• Mark the dimensions • Remove the material by chipping from MS flats
2.Cutting with hack saw of MS flats of 6mm thick (06)	– Check the raw material for size – Fix the work piece in vice – Mark the work as per given dimensions – Perform dot punching – Load and unload hack saw blade from its frame – Use the hack saw to perform cutting operation	• Load and unload hack saw blade from its frame • cut the work as per marked dimensions using Hack saw
3.Drilling, chamfering and on a MS flat of 2 mm thick (06)	– Check the raw material for size – Apply the chalk on the surface and on all sides of the flat – Layout the dimensions and mark the lines using dot punch – Chamfer the edges through filing – Locate the hole centres using odd leg callipers and centre punching – Identify appropriate drill bit – Load and unload drill bit from the machine	• Load and unload drill bit from the machine • Identify appropriate taps • Tap the hole

4.Tapping and Dieing on a MS flat of 2 mm thick (06)	– Check the raw material for size – Identify appropriate tap and die – Secure the tap in the wrench – Tap the hole – Hold the bar in bench vice – Fix the die in die stock – Cut external threads using a Die – Check the fit for accuracy	• Secure the tap in the wrench • Tap the hole • Fix the die in die stock • Cut external threads using a Die
5.Assembling of two pieces, matching by filing (06)	– Cut the pieces to size using hack saw – File surface of flat for trueness – Mark the surfaces as per dimensions – Dot punch the marked lines – Cut with hack saw as per marked lines – Smoot the surfaces with file – Assemble the two pieces	• Identify appropriate file • File the specimen • Assemble two pieces

Title of the Job	Competencies	Key Competencies
Forging shop 6.Conversion of Round to Square (09)	– Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
7.Conversion of Round to Hexagon (09)	– Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
8.Preparation of a Chisel from round rod (09)	– Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
9.Preparation of a ring and hook from M.S round (06)	– Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
10.Preparation of a hexagonal bolt and nut (06)	– Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape

Title of the Job	Competencies	Key Competencies
Carpentry Shop 11.Cutting of wood with hand saw (06)	– Identify the orientation of grains – Select appropriate saw for cutting in each of the directions viz. across and along the grains – Select appropriate work holding device – Handle appropriate measuring and marking tools(Steel rule, Try square, Marking gauge) – Mark dimensions on work using Marking gauge – Fix the work in the vice – Perform cutting along the grains using Rip saw – Change the position of work in the vice – Perform cutting perpendicular the grains using cross cut saw	• Identify the orientation of grains • Mark dimensions on work using marking gauge • Perform cutting along and perpendicular the grains using appropriate saw
12.Planning of wood(06)	– Identify the direction for planning wood stock – Select appropriate jack plane – Prepare the jack plane for planning (Load and unload the blade of a jack plane – Select appropriate work holding device – Perform marking on work using appropriate tool – Fix the work in the vice – Plane the surfaces on all four sides using jack plane	• Identify the direction for planning wood stock • Prepare the jack plane for planning • Plane the surfaces on all four sides using jack plane

Title of the Job	Competencies	Key Competencies
Contd.,,, 13.Chiselling of wood (06)	– Select appropriate chisels and saw – Select appropriate work holding device – Select appropriate measuring and marking tools – Fix the work in the vice – Mark the position of grooves on work using marking gauge – Cut sides of grooves by hand saw – Chip the material using firmer chisel by applying pressure with mallet – Finish the grooves with rasp file	• Select appropriate chisels and saw • Mark the position of grooves on work using marking gauge • Cut sides of grooves by hand saw • Chip the material using firmer chisel by applying pressure with mallet
14.Preparation of a Dove tail joint (09)	- Select the appropriate cutting tools and work holding devices - Plane the wooden pieces on all sides - Mark at an angle of 75^0 with bevel square - Trim the dovetail by chisel to exact size - Cutt the dovetail groove on second piece - Finish the groove - Assemble the two pieces to prepare dovetail halving joint by using mallet	• Trim the dovetail by chisel to exact size • Mark at an angle of 75^0 with bevel square • Cutt the dovetail groove on second piece • Assemble the two pieces to prepare dovetail halving joint by using mallet
15.Preparation of Mortise and Tenon joint (09)	- Select the appropriate cutting tools and work holding devices - Plane the two pieces to the required size using jack plane - Mark the dimensions to make Tenon using mortise gauge - Cut tenon with tenon saw along the marked lines	• Mark the dimensions to make Tenon and mortise on two pieces using mortise gauge • Cut tenon with tenon saw along the marked lines

Title of the Job	Competencies	Key Competencies
Contd.,,,, Preparation of Mortise and Tenon joint	– Use firmer chisel to remove the excess material to set finished tenon – Mark the dimension to make mortise on the second piece with mortise gauge – Use mortise chisel to provide recess in the second piece to accommodate tenon – Assemble the two pieces by fitting the tenon into mortise	• Use mortise chisel to provide recess in the second piece to accommodate tenon • Assemble the two pieces by fitting the tenon into mortise
16.Wood turning on lathe (06)	– Select appropriate tools – Plane the four corners of the work piece using jack plane – Mark the centres of the work on either side – Mount the work between head stock & tailstock centres – Fix the tool in the tool post & Position it in appropriate height – Start the lathe to make the work piece to revolve at desired speed – Feed the bevel gauge against the rotating work to get the required size and shape – Use outside callipers to check the diameter of the pin – Use parting off tool to reduce the diameter on either ends of the pin – Remove the rolling pin between centres and cut off excess material on either sides	• Mark the centres of the work on either side • Fix the tool in the tool post & Position it in appropriate height • Start the lathe to make the work piece to revolve at desired speed • Feed the bevel gauge against the rotating work to get the required size and shape

Title of the Job	Competencies	Key Competencies
Contd.,,, 17.Preparation of any household article (ex: stool) (09)	– Prepare the drawings of a stool required for a particular drawing table – State the specifications of the wood stock required – Identify the type of joints to be made – Identify the operations to be made and their sequence – Perform operations to produce pieces of joint – Assemble all joints as per the drawing	• Prepare the drawings of a stool required for a particular drawing table • Identify the operations to be made and their sequence • Perform operations to produce pieces of joint • Assemble all joints as per the drawing

Title of the Job	Competencies	Key Competency
Sheet metal Work 18.Practice on cutting of sheet (06)	– Cutt the required sheet from the stock using snip – Mark the dimensions on the sheet using scriber & steel rule – Draw the circular shapes using divider – Perform rough cutting of the curved shapes using chisel and finish cutting using snips – Cut the straight edges using straight snips	• Identify the marking and cutting tools • Cut the sheet of different shapes using appropriate tools
19.Formation of joints like grooved joint, locked groove joint (06)	– Cut the sheet in to two halves – Form the flange on the sheet by folding the sheet along scribed lines using mallet & stakes – Perform bending edges of sheets applying moderate pressure using mallet – Inter lock the bent edges and apply pressure with mallet to make required joint	• Identify the marking and cutting tools • Cut the sheet • Perform bending along the marked lines.

Title of the Job	Competencies	Key Competency
20.Preparation of a rectangular open type tray (09)	– Draw the development of the object to be made – Place the pattern on the sheet – Mark the dimensions using scriber – Shear the required piece from the stock using straight snips – Mark the lines on the sheet to form bends – Strengthen the sides of sheet by singe hem using hatchet stake – Form the sheet in to desired shape using stakes – Seam the corners by inserting laps of the adjacent sides with single hem	• Drawing development of objects • Cut the sheet • Seam the corners by inserting laps of the adjacent sides with single hem
21.Preparation of hollow cylinder (06)	– Draw the development of the object to be made – Place the pattern on the sheet – Mark the dimensions using scriber – Shear the required piece from the stock using straight snips – Mark the lines on the sheet to form bends – Strengthen the sides of sheet by singe hem on top & bottom side using hatchet stake – Form the flat sheet into cylindrical shape by cylindrical stake and apply pressure using mallet – Prepare single hem on to longitudinal sides in opposite directions – Inter lock the sides and apply pressure to make a strong joint	• Identify the marking and cutting tools • Drawing development of objects • Cut the sheet • Inter lock the sides and apply pressure using mallet to make a strong joint

Title of the Job	Competencies	Key Competency
22.Preparation of pipe elbow (09)	– Draw the development of a cylindrical pipe truncated at an angle of 45^0 on one side – Scribe the lines on the sheet by placing the pattern on it – Cutt the sheet over the marked dimensions using curved snips – Hem the straight side of the sheet and flange the curved side – Fold the edges of joining sides – Form the sheet into cylindrical shape using stakes – Seam the sides using mallet – Repeat the similar operation for making the second pipe – Butt the treated portions of the cylindrical pipes at rectangles – Seam the two pipes – Solder the joint to make leak proof	• Draw the development of a cylindrical pipe truncated at an angle of 45^0 on one side • Cutt the sheet over the marked dimensions using curved snips • Form the sheet into cylindrical shape using stakes

Title of the Job	Competencies	Key Competency
23.Preparation of funnel (09)	– Draw the development of upper conical part – Place the pattern on the sheet and cut to required size – Hem the upper side of the sheet – Flange out the bottom side of the sheet – Fold the edges of the joining sides – form the sheet into conical shape using appropriate stake and mallet – Repeat the similar operation for making the bottom part – Seam the top conical part and bottom conical part to obtain required funnel	• Draw the development of upper and bottom conical parts • Place the pattern on the sheet and cut to required size • form the sheet into conical shape using appropriate stake and mallet • Seam the top conical part and bottom conical part to obtain required funnel
24.Preparation of utility articles such as dust pan, kerosene hand pump (06)	– Draw the development of given dust pan – Scribe the lines on the sheet and cut to required size – Hem all the four sides to strengthen the edges – Form the sheet into designed shape using suitable stakes and mallet – Solder the corner lap joints to make the required dust pan	• Identify the marking and cutting tools • Drawing development of objects • Cut the sheet • Perform bending along the marked lines and to form the article

COURSE CONTENT

FITTING SHOP

1. Marking and chipping on Mild – steel flat 12 mm thick.
2. Cutting with hack saw, M.S. Flats of 6 mm thick.
3. Marking, cutting, drilling, Chamfering and tapping on a M.S. Flat 12 mm thick.
4. Assembling of two pieces, Matching by filing (6 mm thick M.S. Plate)

FORGING SHOP

1. Conversion of round to square.
2. Conversion of round to Hexagon.
3. Preparation of chisel from round rod.
4. Preparation of ring and hook from M.S. round.
5. Preparation of a hexagonal bolt and nut.

CARPENTRY SHOP

1. Cutting of wood with hand saw.
2. Planning of wood.
3. Planning and chiseling of wood.
4. Orientation of wood grain.
5. Preparation of dovetail joint.
6. Mortise and tenon joint.
7. Wood turning on a lathe.
8. Preparation of one household article.

SHEET METAL WORK

1. Practice on cutting of sheet
2. Formation of joints like grooved joints, locked groove joint
3. Preparation of a rectangular open type tray
4. Preparation of hollow cylinder
5. Preparation of pipe elbow
6. Preparation of mug.
7. Preparation of funnel
8. Preparation of utility articles such as dustpan, kerosene hand pump.

REFERENCE BOOKS

1. Manufacturing Technology (Vol I) by P N Rao (Mc Graw Hill)
2. Principles of Foundry Technology by P L Jain (Mc Graw Hill)

ENGINEERING PHYSICS LAB PRACTICE
(Common to all Branches)

Subject Title : Engineering Physics Lab Practice
Subject Code : ME-109 A
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice the Vernier caliper to determine the volume of a cylinder and sphere
2.0 Practice the Screw gauge to determine thickness of a glass plate and cross section of a wire
3.0 Verify the parallelogram law and Triangle law
4.0 Determine the value of acceleration due to gravity using Simple Pendulum
5.0 Determine the velocity of sound in air at room temperature
6.0 Determine the Focal length and focal power of convex lenses using U-V method
7.0 Determine the refractive index of a solid using travelling microscope
8.0 Determine the surface tension of a liquid using travelling microscope
9.0 Determine the viscosity of a liquid using capillary method
10.0 Verify the Boyle's law employing a Quill tube
11.0 Determine the specific resistance of wire material using Meter Bridge
12.0 Practice the mapping of magnetic lines of force

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
1. Hands on practice on Vernier Calipers	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the volume of given object	• Read the scales • Calculate the volume of given object
2. Hands on practice on Screw gauge	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire	• Read the scales • Calculate thickness of given glass plate • Calculate cross sectior of wire
3. Verification of Parallelogram law of forces and Triangle law of forces	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph	• Find the time for numb r of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 grap
5. Velocity of sound in air –Resonance method	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound • Calculate velocity of

Name of the Experiment	Competencies	Key competencies
6. Focal length and Focal power of convex lens (Separate & Combination)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graph
7. Refractive index of solid using traveling microscope	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water
9. Coefficient of viscosity by capillary Method	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water

Name of the Experiment	Competencies	Key competencies
10. Boyle's law verification	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
11. Meter bridge	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of Force	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

ENGINEERING CHEMISTRY LAB PRACTICE
(Common to all Branches)

Subject Title : Engineering Chemistry Lab Practice
Subject Code : ME -109 B
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making different diluted solution.	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. $KMnO_4$	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength to	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipetts, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.

2.0 Practice making standard solutions with pre weighted salts and to make desired dilutions using appropriate techniques.

3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl

4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0 Conduct titrations adopting standard procedures and using Std. $KMnO_4$ solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions

a) To determine conductivity

b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
Familiarization of methods for Volumetric analysis	--	--
Preparation of Std Na_2CO_3 and making different diluted solution	▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions

Name of the Experiment	Competencies	Key competencies
Estimation of HCl solution using Std. Na_2CO_3 solution	▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
Estimation of NaOH using Std. HCl solution		
Estimation of H_2SO_4 using Std. NaOH solution		
Estimation of Mohr's Salt using Std. $KMnO_4$		
Determination of acidity of water sample		
Determination of alkalinity of water sample		
Determination of total hardness of water using Std. EDTA solution		
Estimation of Chlorides present in water sample		
Estimation of Dissolved Oxygen (D.O) in water sample (By titration method)		
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Determination of pH using pH meter		
Determination of conductivity of water and adjusting ionic strength to required level		
Determination of turbidity of water		

Name of the Experiment	Competencies	Key competencies
Estimation of total solids present in water sample	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDEMENTALS LAB PRACTICE
(Common to all Branches)

Subject Title : **Computer Fundamentals Laboratory Practice**
Subject Code : **ME-110**
Periods/Week : **03**
Periods/Year : **90**

List of Experiments:

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	01	03
II.	Windows Operating System	02	06
III.	MS Word	09	27
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
	Total	30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to widespread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a).To Familiarize with Computer system and hardware connections
   b).To start and Shut down Computer correctly
   c). To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system (Not for end examination)

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics

8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board	a. Login and logout as per the standard procedure b. Operate mouse &Key Board
1 (c).	To Explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	a. Find the details of Operating System being used b. Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders	a. Create files and folders Rename , arrange and search for the required folder/file

Exp No.	Name of the Experiment	Competencies	Key Competencies
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Ed pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers t create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers

Exp No.	Name of the Experiment	Competencies	Key Competencies
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar- Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit

Exp No.	Name of the Experiment	Competencies	Key Competencies
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart	a. Use data in Excel sheet t Create technical charts an graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
21.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in Home, insert , design, animation , slideshow, Review &View in the PowerPoint	Access required options in the tool bar

Exp No.	Name of the Experiment	Competencies	Key Competencies
22.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation	a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects	Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
26.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
27.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.

Exp No.	Name of the Experiment	Competencies	Key Competencies
28.	To Insert audio &video, Hyper links in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like *Entrance, Emphasis, Motion Paths &Exit*	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
III Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
ME- 301	Engineering Mathematics - II	4	-	60	3			100
ME -302	Engineering Materials	5	-	75	3			100
ME -303	Basic Electrical& Electronics Engineering	4	-	60	3			100
ME-304	Basic Thermodynamics	4	-	60	3			100
ME-305	Strength of Materials	5	-	75	3			100
ME-306	Production Technology-I	4	-	60	3			100
PRACTICAL:								
ME-307	Machine Drawing Practice	-	7	105	3			100
ME-308	Fuels Lab Practice	-	3	45	3			100
ME-309	Electrical Engineering Lab Practice	-	3	45	3			100
ME-310	Manufacturing & Fabrication Engg.Lab Practice -I	-	3	45	3			100
	TOTAL	26	16	630				1000

ENGINEERING MATHEMATICS – II
(Common to all Branches)

Subject Title : **Engineering Mathematics-II**
Subject Code : **ME-301**
Periods per week : **04**
Periods per Semester : **60**

Blue print

S. No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
	Unit - I			R	U	App	R	U	App
1	**Indefinite Integration**	18	34	2	1	0	1	1	1/2
	Unit - II								
2	**Definite Integration and its applications**	17	31	0	1	1	0	1	1 1/2
	Unit - III								
3	**Differential Equations of first order**	15	29	2	1	0	1/2	1/2	1
	Unit - IV								
4	**Statistical Methods**	10	16	1	1	0	1	0	0
	Total	60	110	5	4	1	2 1/2	2 1/2	3
			Marks:	15	12	3	25	25	30

R: Remembering type 40 marks
U: Understanding type 37 marks
App: Application type 33 marks

OBJECTIVES

Upon completion of the subject the student shall be able to

Unit-I

1.0 Use Indefinite Integration to solve engineering problems

1.1 Explain the concept of Indefinite integral as an anti-derivative.

1.2 State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\,dx$ and $\int ku\,dx$ where k is constant and u, v are functions of x.

1.3 Solve integration problems involving standard functions using the above rules.

1.4 Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\,dx$ where $f(x)\,dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\,dx$

iii) $\int f'(x)/[f(x)]\,dx$

iv) $\int f\{g(x)\}\, g'(x)\,dx$

1.5 Find the Integrals of *tan x, cot x, sec x* and *cosec x* using the above.

1.6 Evaluate the integrals of the form $\int Sin^m\theta\ Cos^n\theta.\, d\theta$ where m and n are positive integers.

1.7 Evaluate integrals of powers of *tan x* and *sec x*.

1.8 Evaluate the Standard Integrals of the functions of the type

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

1.9 Evaluate the integrals of the type

$$\int \frac{1}{a\pm bSin\theta} d\theta, \int \frac{1}{a\pm b\cos\theta} d\theta \text{ and } \int \frac{1}{a\cos\theta \pm b\sin\theta \pm c} d\theta .$$

1.10 Evaluate integrals using decomposition method.

1.11 Evaluate integrals using integration by parts with examples.

1.12 State the Bernoulli's rule for evaluating the integrals of the form $\int u.v dx$.

1.13 Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\,dx$.

Unit-II

2.0 Understand definite integral and use it in engineering applications

2.1 State the fundamental theorem of integral calculus

2.2 Explain the concept of definite integral.

2.3 Calculate the definite integral over an interval.

2.4 State various properties of definite integrals.

2.5 Evaluate simple problems on definite integrals using the above properties.

2.6 Explain definite integral as a limit of sum by considering an area.

2.7 Find the areas under plane curves and area enclosed between two curves using integration.

2.8 Obtain the volumes of solids of revolution.

2.9 Obtain the mean value and root mean square value of the functions in any given interval.

2.10 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and provide some examples.

Unit -III

3.0 Solve Differential Equations in engineering problems.

3.1 Define a Differential equation, its order, degree

3.2 Form a differential equation by eliminating arbitrary constants.

3.3 Solve the first order first degree differential equations by the following methods:

i. Variables Separable.
ii. Homogeneous Equations.
iii. Exact Differential Equations
iv. Linear differential equation of the form dy/dx + Py = Q, where P and Q are functions of x or constants.
iv. Bernoulli's Equation (Reducible to linear form.)

3.4 Solve simple problems leading to engineering applications

Unit -IV

4.0 Use Statistical Methods as a tool in data analysis.

4.1 Recall the measures of central tendency.
4.2 Explain the significance of measures of dispersion to determine the degree of heterogeneity of the data.
4.3 Find the measures of dispersion – range, quartile deviation, mean deviation, standard deviation for the given data.
4.4 Explain the merits and demerits of the above measures of dispersion.
4.5 Express relationship between measures of dispersion
4.6 Find the coefficient of variation
4.7 Explain bivariate data.
4.8 Explain the concept of correlation between two variables and co-varience.
4.9 Explain coefficient of correlation and its properties
4.10 Calculate the coefficient of correlation between two variables.
4.11 Find rank correlation co-efficient.

COURSE CONTENT

Unit-I

Indefinite Integration:

1. Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of indefinite integral. Integration by substitution or change of variable. Integrals of the form

$\sin^m\theta . \cos^n\theta$. where m and n are positive integers. Integrals of tan x, cot x, sec x, cosec x and powers of tan x, sec x by substitution.

Evaluation of integrals which are reducible to the following forms :

$$i)\frac{1}{a^2+x^2},\frac{1}{a^2-x^2},\frac{1}{x^2-a^2}$$

$$ii)\frac{1}{\sqrt{a^2+x^2}},\frac{1}{\sqrt{a^2-x^2}},\frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\sqrt{x^2-a^2},\sqrt{x^2+a^2},\sqrt{a^2-x^2}$$

Integration by decomposition of the integrand into simple rational, algebric functions. Integration by parts , Bernoulli's rule.

Unit-II

Definite Integral and its applications:

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Volumes of solids of revolution. Mean and RMS values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

Unit -III

Differential Equations:

3. Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of first order, first degree: variable-separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Unit –IV

Statistical Methods:

4. Revise measures of central tendency, measures of dispersion: range, quartile deviation, mean deviation, standard deviation for the given data, merits and demerits, relationship between measures of dispersion, coefficient of variation, bivariate data, concept of correlation, covariance, coefficient of correlation and its properties, rank correlation co-efficient.

Reference Books:

1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. Statistical Methods Vol.I, Das, Tata McGraw-Hill
4. Statistics, 4/e, Schaum's Outline Series (SIE), McGraw-Hill

ENGINEERING MATERIALS

Subject Title : Engineering Materials
Subject Code : ME-302
Periods per week : 05
Periods per Semester : 75

TIME SCHEDULE

Sl. No	Major Topics	No. of Periods	Weightage of Marks	Short answer Questions	Essay Type Questions
1	Introduction & Mechanical properties of engineering materials	04	05	--	½
2	Testing of materials	08	13	01	01
3	Structure of Materials	08	13	01	01
4	Production of Iron and Steel	10	13	01	01
5	Iron Carbon Equilibrium Diagram	12	16	02	01
6	Heat treatment of Steel	12	16	02	01
7	Ferrous, Non Ferrous Metals and their alloys	14	21	02	1 ½
8	Powder Metallurgy	07	13	01	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the Mechanical properties of engineering materials

1.1 State the importance of various Engineering Materials used in Mechanical processes / industries.
1.2 List the various engineering materials and their applications.
1.3 Define the following Properties.
i) Tensile, compressive and shear strength
ii) Ductility iii) Hardness iv) Toughness v) Brittleness
vi) Impact strength vii) Fatigue and Creep strength

2.0 Understand the procedures of Testing of Materials

2.1 Differentiate between destructive and non-destructive tests.
2.2 Describe the testing procedure for tensile strength, compression strength, shear strength, Impact strength, and hardness of metals.
2.3 Describe the procedure for Testing Materials by X- Ray, gamma – Ray, Magnaflux, Ultrasonic and penetrate test.

3.0 Indentify the Structure of materials

3.1 State the meaning of space lattice.
3.2 Define unit cell.
3.3 Describe the three main types of space lattice with legible sketch.
3.4 State the formation of grains by dendrite growth.
3.5 State the effect of rate of cooling on grain formation.
3.6 State the effect of grain size on mechanical properties.
3.7 Identify the factors promoting grain size.
3.8 Identify important stages in the phenomenon of recrystallisation.

4.0 Understand the Production of Iron and Steel

4.1 Name the various raw materials required for production of iron.
4.2 Describe the Blast furnace to produce Pig Iron in with legible sketch
4.3 Describe the puddling furnace to produce wrought iron with legible sketch.
4.4 Explain the process of manufacturing cast iron in Cupola with legible sketch.
4.5 Describe the steps in manufacturing steel by Bessemer process, L.D. process, Open Hearth and Electric Process.

5.0 Understand the phases of Iron - Carbon Equilibrium Diagram

5.1 Explain the cooling curves of pure metal with legible sketch.
5.2 Identify the allotropic forms of pure iron with temperatures, their crystal structures.
5.3 Draw the iron carbon diagram and identify various structures of the iron carbon system.
5.4 Locate Eutectic, Peritectic and Eutectoid points from the Iron Carbon diagram.
5.5 Obtain the composition of phases in a steel/cast Iron from the iron carbon diagram.

6.0 Understand the Heat Treatment Processes of Steel.

6.1 State the importance of heat treatment for steels.
6.2 Describe the main features of the various heat treatment operations.
6.3 Differentiate between annealing and normalizing.
6.4 Describe the effect of cooling rate in hardening.
6.5 State the importance of tempering.
6.6 Explain the use of case hardening processes like; carburizing, nitriding and cyaniding
6.7 Describe TTT curves with legible sketch
6.8 Explain the processes Sub Zero treatment and Vacuum Hardening

7.0 Use the Ferrous, Non-Ferrous Metals and their alloys

7.1 Classify of Cast Iron – Grey, White, Malleable, Spheroidal – composition, properties and applications.
7.2 State the basis of classification of plain carbon steels.
7.3 List the application of these steels.
7.4 Describe the need for alloying the steel with other elements.
7.5 State the composition and properties of alloy steels.
7.6 List industrial applications of alloy steels.
7.7 Identify the need for non-ferrous metals and their alloys in engineering application.

7.8 Describe the properties of –Copper, Aluminum, Tin, Zinc, lead, Nickel, Magnesium and Chromium.
7.9 Indicate the composition, properties, and industrial application of the important – non-ferrous alloys.
7.10 Identify the properties of bearing metals.

8.0 Understand the processes and methods in Powder Metallurgy.
8.1 Explain the applications of powder metallurgy as a primary manufacturing process.
8.2 State the important characteristics of metal Powders.
8.3 Explain the methods of producing powders.
8.4 Explain the following processes of forming to shape
i) Pressing, ii) Centrifugal compacting, iii) Extruding,
iv) Gravity sintering, v) Rolling, vi) isostatic moulding,
vii) Explosive compacting, viii) Hot pressing, ix) spark sintering.
8.5 Explain the finishing operations.
8.6 State the advantages and limitations of powder metallurgy.

COURSE CONTENT

1.0 Introduction, Mechanical properties of engineering materials
1.1 A few Mechanical Engineering Materials, Importance of their study with applications.
1.2 Various mechanical properties of engineering materials – Tensile strength, Compressive strength, Ductility, Malleability, Hardness, Toughness, Brittleness, Impact strength, Fatigue, Creep resistance

2.0 Testing of materials
2.1 Destructive testing tests on UTM to determine tensile, compressive and shear strengths – Tests on Brinell & Rock Well hardness test – Impact test on Izod & Charpy tester.
2.2 on destructive testing – Procedure for testing materials by X-ray, gamma ray, magnetic flux and ultrasonic testing.

3.0 Structure of Materials
3.1 Crystals of metals, Space lattices, Unit cell, three main types of metallic space lattices, namely Face Centered Cubic, Body Centered Cubic, Hexagonal Close Packed.
3.2 Crystallisation of metal, formation of grains by dendrite growth, grain boundary, grain size control, effect of grain size on properties – factors

4.0 Production of Iron and Steel.
4.1 Raw materials, iron ores, Lime stone, Coal-their availability in India. General Survey of Iron and steel making in India.
4.2 Manufacturing of pig iron from blast furnace.
4.3 Wrought iron by pudding furnace and Cast Iron from cupola.
4.5 Production of steel by Bessemer, L.D. process; Open hearth and Electric processes.

5.0 Iron - Carbon Equilibrium Diagram.
5.1 Cooling curve for pure metal.
5.2 Allotropic forms of pure Iron.
5.3 Iron carbon equilibrium diagram.

6.0 Heat Treatment of Steels.

6.1 Importance of heat treatment.

6.2 Heat treatment processes – annealing, normalizing, hardening, tempering, carburizing, nitriding and cyaniding with specific examples of engineering applications of the above.

6.3 Sub Zero treatment – its importance.

6.4 Vacuum hardening – its importance.

7.0 Ferrous, Non- Ferrous metals and their alloys.

7.1 Classification of Cast Iron – Grey, White, Malleable, Spheroidal – Composition, properties and applications.

7.2 Plain Carbon Steels: Effect of carbon in steels, Soft, Mild, Medium and High carbon and also their properties and applications.

7.3 Alloy Steels: Nickel Steels, Chromium steels, 18/8 stainless steel, High Speed Steels, Manganese Steel.

7.4 Properties and uses of Copper, Aluminium, Tin, Zinc, Lead, Nickel, Magnesium and Chromium.

7.5 Muntz metal, Admiral metal, Phosphour Bronze, Gun Metal.

7.6 Aluminum Bronze, Constantan, Monel Metal.

7.7 Properties of Bearing metals, Babbit metals.

8.0 Powder Metallurgy.

8.1 Primary manufacturing process – definition, important characteristic of metal powders,

8.2 Methods of producing powders.

8.3 Forming to shape – pressing, centrifugal compacting., Extruding, Gravity sintering, Rolling, isostatic moulding explosive compacting, , sintering, Hot pressing, spark sintering,

8.4 Finishing operation.

8.5 Advantages and limitations of powder metallurgy.

REFERENCE BOOKS

1.	Powder Metallrgy	by	TTTI,ECH
2.	Material Science	by	Raghavan
3.	Physical Metallurgy	by	Avner
4.	Introduction to Engineering Materials	by	B.K Agarwak (McGraw-Hill)

ELECTRICAL ENGINEERING & BASIC ELECTRONICS

Subject Title : Basic Electrical & Electronics Engineering
Subject Code : ME-303
Periods/Week : 04
Periods per semester : 60

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1.	Electrical engineering fundamentals	12	29	03	2
2.	D.C. Machines	12	18	01	1½
3.	A.C. Fundamentals & A.C. Machines	20	34	03	2 ½
4.	Semi Conductors	08	13	01	1
5.	Electrical measuring instruments & Safety procedures	08	16	02	1
Total		**60**	**110**	**10**	**08**

OBJECTIVES

Upon completion of course the student shall be able to

1.0 Comprehend Basic Electrical Fundamentals.

1.1 Define Ohm's Law.
1.2 State the Laws of Resistance.
1.3 State work, power and energy, with units.
1.4 State Kirchoff ' s laws.
1.5 Explain Kirchoff ' s laws.
1.6 Solve simple Problems on the above.
1.7 Define
a) Magnetic field strength, b) Flux, c) Permeability, d) Reluctance
1.8 Define
a) Electric field, b) Electric field intensity, c) Permittivity
1.9 State capacitance.
1.9 State Faradays laws of Electro Magnetic Induction. (no problems)
1.10 Explain dynamically and statistically induced E.M.F. (no problems)
1.11 State Lenz's Law. (no problems)
1.12 Explain Fleming's right hand rule. (No problems)
1.13 Explain inductance
a) Self inductance, b) Mutual inductance, c) Coefficient of coupling
1.14 Solve problems on self and mutual inductances.
1.15 Explain energy stored in a magnetic field.
1.16 Derive an expression for lifting power of a magnet.

2.0 Understand D.C. Machines.

2.1 Explain the working principle of D.C. Generator.
2.2 Explain Constructional features of D.C. Generator and materials used.

2.3 (a) List the types of D.C. Generators.
(b) Draw schematic diagram of each type.
2.4 (a) Write formula for E.M.F equation of a D.C.Generator [No derivation]
(b) State the relation between currents and voltages for different types of D.C generators.
2.5 Label the terminals of a D.C. Generator for armature, field and inter pole windings.
2.6 Draw power flow diagram of D.C. Generator. (no problems on above)
2.7 Draw the connection diagram of welding generator
2.8 Explain the principle of operation of D.C. Motor.
2.9 (a) List types of motors.
(b) Draw Schematic diagram of each type.
2.10 (a) Explain back e.m.f.
(b) State the relation between currents and voltages.
2.11 Write formula for speed of D.C. Motor in terms of supply voltage, current and flux.
2.12 Explain necessity of starters.
2.13 Describe with a legible sketch the connection diagram of D.C. 3 point Starter.
2.14 Explain speed control of D.C. Motors.
a). Field control b). Armature control
2.15 List the applications of D.C. motors

3.0 Understand A.C. Fundamentals and A.C.Machines

3.1 Explain
i) Alternating current, ii) Amplitude (Peak Value), iii) Time Period
iv) Frequency, v) Instantaneous value, vi) Average value
vii) R.M.S Value, viii) Form Factor
3.2 Explain graphical and vector representation of alternating quantities.
3.3 Explain phase, phase difference.
3.4 State power in an A.C. circuit and power factor [No derivation]
i) Pure resistance, ii) Pure inductance, iii) Capacitance
3.5 Explain single phase circuit
a) Simple series circuit consisting R-L, R-C, and R-L-C.
b) Simple parallel circuit R-L-C.
3.6 Calculate the impedance, current, PF, Power and Voltage drops in a given (R-L-C) circuit.
3.7 Solve simple problems on series circuits.
3.8 Explain poly phase and 3 phase system.
3.9 Explain phase difference in 3 phase system.
3.10 Explain Star-Delta connections.
3.11 Explain working principle of alternator.
3.12 Explain constructional features of Alternators.
3.13 Derive frequency and speed relations.
3.14 Explain working principle of transformer and rating of transformer.
3.15 Write relation between turns ratio, Voltage ratio and current ratios
3.16 Describe with a legible sketch a welding Transformer.
3.17 Explain three phase induction motor working Principle.

3.18 Explain constructional features of – 3 phase Induction motors with legible Sketch
a) Squirrel cage induction motor, b) Wound rotor induction motor.
3.19 Describe with a legible sketch
a)D.O.L Starter, b) Star – Delta Starter, c) Rotor resistance starter
3.20 Explain forward and reverse running of Induction motor.
3.21 State the application of 3 phase induction Motor.
3.22 Explain the working principle of single Phase induction motor.
3.23 List types of single phase induction Motors.
3.24 Draw circuit diagram for single phase Induction motors.
3.25 Explain forward and reverse running of Single phase induction motor.
3.26 List the Applications of single phase induction Motors.

4.0 Understand the Principles of Semi-Conductor Devices.

4.1 Classify materials as conductor, semi-conductors and insulators.
4.2 Distinguish between intrinsic and extrinsic semiconductors.
4.3 Describe the formation of P- type and N- type materials.
4.4 Identify majority and minority carries in P&N type materials.
4.5 Explain the formation of PN Junction diode.
4.6 Describe the working of PN junction diodes with forward bias & reverse bias with the help of legible sketch.
4.7 Understand the working of PNP & NPN transistors
4.8 Draw the different transistor configuration.
4.9 Draw the input & output characteristics of C.B., C.E & C.C. configuration.
4.10 Describe the operation of Zener diode with the help of legible sketch.
4.11 Distinguish between Zener & Avalanche break – down.
4.12 Explain the operation of LED, LCD & the materials used.

5.0 Understand Electrical Measuring Instruments and Safety Procedures.

5.1 Explain construction details and working principle of moving Coil ammeter and volt meter.
5.2 Explain construction details and working principle of moving iron ammeter and voltmeter.
5.3 Explain construction details working principle of dynamometer type wattmeter.
5.4 Explain construction details and working principle of A.C. single phase induction type energy meters.
5.5 Draw the connection diagram of single phase energy meter with load.
5.6 Explain effect of electrical shock and burn.
5.7 State procedure to be adopted in case of electric shocks.
5.8 State purpose of earthling of electrical equipment and machinery.
5.9 Describe the procedure for pipe earthling with the help of legible sketch

COURSE CONTENT

1.0 Basic Concepts and Electro Magnetic Induction

1.1 Definitions: Ohm' Law, Laws of resistance work, power, energy with units.
1.2 Kirchoff's Laws – Simple problems.
1.3 Definitions and units magnetic field strength, flux, flux density, permeability, reluctance.
1.4 Definitions and units electric field, field strength, permittivity, capacitance.

1.5 Faraday's laws of Electro – magnetic induction.
1.6 Dynamically and statically induced e.m.f.
1.7 Lenz's Law, Fleming's right hand rule.
1.8 Problems on above.
1.9 Inductance – self and mutual – coefficient of coupling.
1.10 Energy stored in a magnetic field.
1.11 Lifting power of magnet.

2.0 D.C. Machines

2.1 **D.C. Generators**

a) Principle of operation.b) Parts of generator and materials use.
c) Types of generators and schematic diagrams.
d) E.M.F equation (No derivation) and voltage current relations.
e)Nomenclature used for determining armature, field and interpole windings etc.
f) Power flow diagram,g) Welding Generator.

2.2 **D.C. Motors**

a) Principle of operation, b)Types of motors and schematic diagrams
c) Back e.m.f and speed equation and relation between voltages and currents.
d) Starters necessity and connection diagram of 3 point starter.
e) Speed control – field and armature control, f) Applications of motors.

3.0 A.C. Fundamentals and Machines

3.1 Definition – alternating current, voltage amplitude, time period frequency, instantaneous value, Average value, r.m.s. value, form factor.
3.2 Graphical and vector representation of Alternating quantities.
3.3 Phase difference.
3.4 Power in A.C. Circuits and power factor (No Derivation).
3.5 Nature of current when alternating voltage is applied to pure resistance, inductance and capacitance – magnitude of current, power factor, power factor angle and power.
3.6 A.C. Circuits.
3.7 Single phase series circuits – calculation of impedance, current , power factor, power and voltage drops.
3.8 3 – phase circuits
a) Definition of poly – phase and 3 Ø circuits.,b) Phase difference in 3 Ø
c) Star and delta connections, definitions of phase values and line values.
3.9 Alternators – principle of working.
3.10 Constructional features of alternators.
3.11 Speed and frequency relations.
3.12 Transformers working principle.
3.13 Single phase transformers.
a) Voltage ratio b) Current ratio ,c) Turns ration.
3.14 Welding transformer.
3.15 Phase Induction Motor
a) Working principle of induction motor.
b) Construction of induction motor
i) Squirrel cage induction,ii) Wound Rotor induction motor.
c) Starters.

i) D.O.L, ii) Star/Delta starter, iii) Rotor resistance starter.
d) Forward and reverse running of Induction motors.

3.16 Single phase induction motors.
a) Types of single phase induction motors.
b) Circuit diagram of each type of single Phase induction motor.
c) Forward and reverse running of single Phase induction motors.
d) Applications of single phase induction Motors.

4.0 Semi – Conductors.

4.1 Semi – conductors – N-Type, P-type.
4.2 Behaviour of PN Junction diode
4.3 Introduction of PNP, NPN Transistors.
4.4 Transistor configuration – Zener diodes.
4.5 LED, LCD, Seven segment display.

5.0 Electrical Measuring Instruments & Safety Procedures

5.1 Construction and principle of operation of moving coil permanent magnet type ammeter and voltmeter and moving iron ammeter and voltmeter.
5.2 Construction and working principle of
a) Dynamometer and wattmeter.
b) A. C. Single phase induction type Energy meter.
c) Connection diagram of single phase energy meters with load
5.3 Safety Procedures.
a) Effects of shock and burns.
b) Procedures to be adopted in case of electrical shocks.
c) Earthing of electrical equipment and machine.

REFERENCE BOOKS

1. Theraja B.L. - A Text Book of Electrical Engg. and Electronics.
2. Mehtha.V.K - Principles of Electronics
3. Gupta - Fundamentals of Elec. Engg.
4. Uppal - A Text Book of Elec.Engg & Electronics.

BASIC THERMODYNAMICS

Subject Title : Basic Thermodynamics
Subject Code : ME-304
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Fundamentals and laws of thermo-dynamics	12	24	03	1 ½
2	Laws of perfect gases	10	21	02	1 ½
3	Thermodynamic processes in gases	22	36	02	03
4	Fuels and combustion	16	29	03	02
	Total	**60**	**110**	**10**	**08**

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the Fundamentals and laws of Thermodynamics.

1.1 Define the various terms associated with the thermodynamic system.
1.2 Name the types of thermodynamic systems.
1.4 Explain the closed system with examples.
1.5 Explain the open system with examples
1.6 Explain the isolated system with examples.
1.7 List the thermodynamic properties of system.
1.8 Define the various thermodynamic properties.
1.9 Write examples for each property and its units of measurement.
1.10 State the number of properties required to define the state of a system.
1.11 Define the modes of energy transfer to and from a system.
1.12 Represent the state of a system on a graph.
1.13 State the Zeroth law of thermodynamics.
1.14 State the first law of thermodynamics.
1.15 State the second law of thermodynamics.
1.16 Solve problems dealing with conversion of heat into work and vice – versa.
1.17 Write non-flow energy equation.
1.18 Write steady flow energy equation
1.19 Solve simple problems on energy equation.

2.0 Understand the laws of perfect gases.

2.1 Define the term 'Perfect Gas'.
2.2 State "Boyle's law".
2.3 State "Charle's law".
2.4 State "Avagadro's law".
2.5 State "Regnault's law".
2.6 State "Joule's law".
2.7 Derive characteristic gas equation.
2.8 Write the universal gas equation.
2.9 State relationship between characteristic gas constant (R), universal gas constant (G) and molecular weight (M).
2.10 Define specific heat at constant pressure (C_p).
2.11 Define specific heat at constant volume (Cv).
2.12 Infer why C_p is more than C_v?
2.13 Derive the relationship connecting the two specific heats and characteristic gas constant (R).
2.14 Solve simple problems using gas laws.

3.0 Understand Thermodynamic Processes on gases.

3.1 List the different thermodynamic processes on gases.
3.2 Derive an expression for work done in Iso-choric process.
3.3 Derive an expression for work done in Iso-baric process.
3.4 Derive an expression for work done in hyperbolic process.
3.5 Infer that Isothermal process is the same as hyperbolic process for gases.
3.6 Derive an expression for work done in polytropic process.
3.7 Derive an expression for work done in isentropic process.
3.8 Justify that work done in throttling process is zero.
3.9 Explain the concept of entropy.
3.10 Derive the expression for change of Entropy for the above processes.
3.11 Compute the change in internal energy of gas during a process.
3.12 Write the relationship between heat supplied, internal energy and work done.
3.13 Draw pressure- volume and temperature - Entropy diagram for the above processes.
3.14 Solve simple problems on the above processes.

4.0 Understand the concept of fuels and combustion.

4.1 Define the term fuel.
4.2 Name different types of fuels with examples.
4.3 List the applications of different fuels.
4.4 Define higher calorific value of a fuel.
4.5 Define lower calorific value of a fuel.
4.6 Re-write Du long's formula for calorific value from chemical composition of a fuel.
4.7 Estimate the calorific value using the above formula.
4.8 Compare solid, liquid and gaseous fuels.
4.9 Explain with line diagram the components of a Bomb-calorimeter.
4.10 Narrate the sequence of procedure for the determination of calorific value using Bomb calorimeter.
4.11 Compute the calorific value using the test data on a bomb calorimeter unit.
4.12 Explain the working principle of Junker's gas calorimeter with a line diagram.

4.13 Narrate the sequence of procedure in the determination of C.V. of a gaseous fuel with Junker's calorimeter.
4.14 Calculate the C.V. of a fuel with the help of test data.
4.15 Write the balance of chemical equation for the composition of Unit mass/unit volume of a given fuel.
4.16 Estimate the minimum air required for complete combustion of unit mass / unit volume of a fuel of given composition.
4.17 Estimate the percentage composition of flue gases during combustion with or without excess air.
4.18 Estimate the weight of exhaust gases obtained by complete combustion of unit weight of a fuel of given composition.
4.19 Explain with a line diagram the working of Orsat's apparatus.
4.20 Narrate the sequential procedure in conducting flue gas analysis by using Orsat's apparatus.
4.21 Explain with the help of line diagram the working of mechanical type of CO_2 recorder.

COURSE CONTENT

1.0 Fundamentals and laws of Thermodynamics.

1.1 Definitions for system - boundary, surroundings, working fluid and state of a system.
1.2 Types of thermodynamic systems – closed, open and isolated systems with examples.
1.3 Properties of system- Intrinsic and Extrinsic properties with examples.
1.4 Definitions for properties like pressure (p), Volume (v), Temperature (T), Enthalpy (H), Internal energy (U) and their units.
1.5 Definitions for quasi-static work, flow- work, specific heat.
1.6 Zeroth, first, second laws of thermodynamics, simple problems on conversion of Heat into Work and vice versa.
1.7 Steady flow energy equation (without proof), simple problems.

2.0 Laws of perfect gases.

2.1 Brief explanation of perfect Gas Laws – Boyle's law, Charle's Law – Avagadro's Joule's law and Regnault's law.
2.2 Derivation of characteristic gas equation - universal gas equation, universal gas constant and their relationship with molecular weight of gas.
2.3 Specific heat at constant pressure, specific heat at constant volume for a gas. Derivation for an expression showing the relationship between the two specific heats and characteristic gas constant.
2.4 Simple problems on gas equation.

3.0 Thermodynamic processes on gases.

3.1 Types of thermodynamic processes, Isochoric, Isobaric, Isothermal, Hyperbolic, Isentropic, Polytrophic and Throttling processes. Equations representing the above processes.
3.2 Concept of Entropy.
3.3 Derivation for work done, change in internal energy and Entropy for the above processes.
3.4 Calculation of heat supplied or rejected during the above processes.
3.5 Simple problems on the above processes.

4.0 Fuels and Combustion.

4.1 Definition of fuel. Types – solid, liquid and gaseous fuels, examples and uses of different types of fuels.

4.2 Calorific values (Higher and lower) of fuels, Dulong's formula for calorific value. Calculation of calorific value of a fuel with given chemical composition.

4.3 Bomb calorimeter unit-description-procedure for determination of C.V. of solid or liquid fuel using Bomb calorimeters, calculation of C.V. with test data.

4.4 Junker's Gas calorimeter unit – description – determination of calorific value of gas using Junker's calorimeter.

4.5 Problems on C.V. determination with Junker's calorimeter test data.

4.6 Balance chemical equations for the combustion of carbon, Hydrogen, sulphur, Methane, Ethane etc.

4.7 Calculation of minimum air required for the complete combustion of unit mass/unit volume of fuel having a given composition. Conversion of volumetric analysis to gravimetric analysis, and vice-versa. Calculation of percentage composition (by weight and volume) of flue gases. Calculation of weight of flue gases obtained by combustion of fuel with and without excess air, simple problems.

4.8 Brief description of Orsat's Apparatus & use, procedure for determination of flue gas analysis, chemicals used for absorption of different gases in flue gases.

4.9 Brief description and working of a mechanical type of CO_2 recorder.

REFERENCE BOOKS

1.0 Engineering Thermodynamics by P. K. Nag TMH Publishers

2.0 Engineering Thermodynamics by C. P. Arora

3.0 Thermal Engineering by Mahesh M Rathore TMH Publishers

3.0 Thermal Engineering - R. S. Khurmi S.Chand & Company

STRENGTH OF MATERIALS

Subject Title : Strength of Materials
Subject Code : ME-305
Periods/Week : 05
Periods per Semester : 75

TIME SCHEDULE

S No.	Major Topics	No. of Periods	Weightage of Marks	Short answer Questions	Essay type Questions
1	Simple Stresses and Strains	16	21	02	1½
2	Strain energy	08	13	01	01
3	Shear Force and Bending moment	14	21	02	1½
4	Theory of Simple bending & Deflection of Beams	14	21	02	1½
5	Torsion in Shafts & Springs	15	21	02	1½
6	Thin Cylinders	08	13	01	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the concept of Simple Stresses and Strains

1.1 Define the term strength,
1.2 Define the Mechanical properties of commonly used engineering materials.
1.3 Explain the nature and effect of tensile, compressive and shear forces.
1.4 Define the terms stress, strain, Poisson's ratio and elastic modulii
1.5 Draw the typical stress - strain curve for ductile and brittle materials under tension indicating salient points on it.
1.6 State the significance of Factor of Safety.
1.7 Write down the relation between elastic constants E, N, K, & 1/m.
1.8 Compute stress and strain values in bodies of uniform section and of composite section under the influence of normal forces.
1.9 Calculate thermal stresses, in bodies of uniform section and composite sections.
1.10 Compute changes in axial, lateral and volumetric dimensions of bodies of uniform sections under the action of normal forces.

2.0 Understand the concept of Strain Energy

2.1 Define resilience, proof – resilience and modulus of resilience.
2.2 Derive an expression for the strain energy.
2.3 Obtain expressions for instantaneous stress developed in bodies subjected to –
i) Gradually applied load,ii) Suddenly applied load, iii) Impact/shock load.
2.4 Compare of proof resilience in bodies subjected to the above loads.

3.0 Understand the concept of Shear Force and Bending Moment Diagrams

3.1 List the types of beams.
3.2 List the types of loading
3.3 Explain the terms shear force and bending moment.
3.4 Compute shear force and bending moment at any section of beam (for UDL and Point loads)
3.5 Practice the diagrams of S.F. & B.M for UDL and Point loads

4.0 Understand the concept of Theory of Simple Bending and Deflection of Beams

4.1 State the theory and terms of simple bending.
4.2 List the assumptions in theory of simple bending
4.3 Derive the bending equation $M / I = \sigma / y = E / R$
4.4 Calculate Bending stress, Modulus of section and Moment of resistance.
4.5 Calculate the safe load, safe span and dimensions of cross section.
4.6 Explain the term deflection
4.7 State the formulae for deflection in cantilever and simply supported beams
4.8 Calculate the values of deflection in the given beams.

5.0 Understand the concept of Torsion in Shafts and Springs

5.1 Function of Shaft
5.2 Explain Polar M.I. of solid and hollow shaft
5.3 List the assumptions in theory of Simple Torsion
5.4 Derive the torque equation $T / J = fs / R = G\theta / L$
5.5 Design solid and hollow shafts
5.6 Compare strength and weight of solid and hollow shafts of the same length and material
5.7 State the function of spring
5.8 List the types of springs
5.9 List all the applications of springs
5.10 Define the terms related to closed coil helical spring
5.11 State the formulae for the stress and deflection of closed coil helical spring
5.12 Compute the stress and deflection of the closed coil helical spring

6.0 Understand the concept of Thin Cylindrical Shells

6.1 Define cylindrical shell
6.1 Define longitudinal and hoop stress
6.2 Derive the expression for longitudinal and hoop stress for seamless and seam shells.
6.3 Design thin cylindrical shells.

COURSE CONTENT

1 Simple Stresses and Strains

1.1 Types of forces.
1.2 Stress, Strain and their nature.
1.3 Mechanical properties of common engineering materials.
1.4 Significance of various points on stress – strain diagram for M.S. and C.I. specimens
1.5 Significance of factor of safety
1.6 Relation between elastic constants.

1.7 Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces.
1.8 Thermal stresses in bodies of uniform section and composite sections.
1.9 Related numerical problems on the above topics

2 Strain Energy

2.1 Strain energy or resilience, proof resilience and modulus of resilience.
2.2 Derivation of strain energy for the following cases
i) Gradually applied load, ii) Suddenly applied load, iii) Impact/shock load.
2.3 Related numerical problems.

3 Shear Force & Bending Moment Diagrams

3.1 Types of beams with examples.
a) Cantilever beam, b) Simply supported beam, c) Over hanging beam,
d) Continuous beam, e) Fixed beam.
3.2 Types of Loads – Point load, UDL and UVL.
3.3 Definition and explanation of shear force and bending moment.
3.4 Calculation of shear force and bending moment and drawing the diagrams by the analytical method only for the following cases.
a) Cantilever with point loads, b)Cantilever with uniformly distributed load.
b) Simply supported beam with point loads.
c) Simply supported beam with uniformly distributed load.
d) Over –hanging beam with point loads, at the centre and at free ends.
e) Over – hanging beam with uniformly distributed load throughout.
f) Combination of point and UDL.for the above and problems there upon.

4 Theory of Simple Bending and Deflection of Beams

4.1 Explanation of terms
a) Neutral layer, b) Neutral Axis, c) Modulus of Section,
d) Moment of Resistance, e) Bending stress, f) Radius of curvature.
4.2 Assumptions in theory of simple bending.
4.3 Bending Equation $M / I = \sigma / Y = E / R$ with derivation.
4.4 Problems involving calculations of bending stress modulus of section and moment of resistance.
4.5 Calculation of safe loads and safe span and dimensions of cross- section.
4.6 Definition and explanation of deflection as applied to beams.
4.7 Deflection formulae without proof for cantilever and simply supported beams with point load and uniformly distributed load only (Standard cases only).
4.8 Related numerical problems.

5 Torsion in Shafts and Springs

5.1 Definition and function of shaft
5.2 Calculation of polar M.I. for solid and hollow shaft.
5.3 Assumptions in simple torsion
5.4 Derivation of formula $T / J = fs / R = G\theta / L$
5.5 Problems on design of shaft based on strength and rigidity
5.6 Numerical Problems related to comparison of strength and weight of solid and hollow shafts.
5.7 Explanation about spring
5.8 Classification of springs

5.9 Nomenclature of closed coil helical spring
5.10 Deflection formula for closed coil helical spring (without derivation)
5.11 Explanation about stiffness of spring
5.12 Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils

6 Thin Cylindrical Shells

6.1 Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell.
6.2 Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells.
6.2 Related numerical Problems for safe thickness and safe working pressure.

REFERENCE BOOKS:

1. Strength of Materials by B.C.Punmia
2. Strength of Materials by R.S. Khurmi S & Chand Company
3. Strength of Materials by Ramamrutham

PRODUCTION TECHNOLOGY - I

Subject Title : Production Technology - I
Subject Code : ME–306
Periods per Week : 04
Periods per Semester : 60

TIME SHEDULE

S.No	Major Topics	Number of Periods	Weightage of Marks	Short answer Questions	Essay type Questions
1	Lathe & Lathe Work	20	29	03	02
2	Shaper, Slotter, Planner	14	29	03	02
3	Broaching Machine	04	10	--	01
4	Cutting Fluids, Coolants and Lubricants	06	13	01	01
5	Welding	16	29	03	02
	Total	**60**	**110**	**10**	**08**

OBJECTIVES

Up on completion of the course the student shall be able to

1. **Understand the construction details of Lathe & Lathe Work**
   - 1.1 State the working principle of lathe.
   - 1.2 Classify lathes.
   - 1.3 Draw the line diagram of engine lathe.
   - 1.4 List the parts of lathe.
   - 1.5 Describe the functions of each part in lathe.
   - 1.6 Indicate the specifications of a lathe.
   - 1.7 List the various operations performed on lathe including special operations.
   - 1.8 Explain methods of taper turning with line diagrams.
   - 1.9 Calculate the included angle for taper turning.
   - 1.10 List different work holding devices.
   - 1.11 Explain the Nomenclature of Lathe (single point) tool with the help of legible sketch
   - 1.12 Explain the Significance of various angles.
   - 1.13 List the various types of production lathes.
   - 1.14 Illustrate the working principle of turret lathe, Capstan, Automatic and Semi-automatic lathes & copying lathes.
   - 1.15 Distinguish between automatic and semi-automatic lathes.
   - 1.16 Explain the need of copying lathes.
   - 1.17 State the advantages and applications of production lathes.

2.0 Understand the construction details and working principle of Shaper, Slotter and Planer

2.1 Illustrate the working principles of shaper, slotter, and planer.
2.2 Illustrate the constructional details of the above machines.
2.3 Explain the functions of important parts of the above machines.
2.4 List the operations performed on these machines.
2.5 State the specifications of each machine.
2.6 Explain the principle of quick-return mechanism as applied to shaper/planer.
2.7 Describe the different methods of obtaining quick return motion.
2.8 Explain the principle of hydraulic drive with the help of a line diagram applied to shaper.

3.0 Understand the construction details and working principle of Broaching machine

3.1 Define Broaching.
3.2 Classify broaching machines.
3.3 Illustrate the working principles of broaching machines.
3.4 Illustrate the constructional details of the broaching machines.
3.5 State the advantages & limitations of broaching.

4.0 Understand the concept of Cutting Fluids, Coolants & Lubricants.

4.1 State the properties of cutting fluids and coolants.
4.2 Mention the types of fluids.
4.3 State the composition of cutting fluids and coolants.
4.4 List the relative merits of the cutting fluids and coolants.
4.5 Select the proper cutting fluids and coolants for various machining operations.
4.6 Classify the lubricants.
4.7 List all the properties of lubricants.

5.0 Understand the joining process of Welding.

5.1 State the necessity of welding.
5.2 Classify the welding processes.
5.3 State the advantages and limitations of welding.
5.4 Explain the principle of arc welding.
5.5 List the tools and equipment of arc welding.
5.6 Name the proper electrodes for given metals.
5.7 Explain the principle of gas welding.
5.8 List the tools and equipment of oxy-acetylene welding.
5.9 Explain different welding procedures in arc and gas welding.
5.10 Define the terms soldering & brazing.
5.11 Differentiate soldering from brazing.
5.12 Explain the principles of soldering & brazing.
5.13 Select correct soldering materials for a given job.
5.14 Explain soldering / brazing techniques.
5.15 List the gas cutting equipment.
5.16 State the principle of flame cutting.
5.17 State the relative advantages of flame cutting over other types of cutting.
5.18 List the various defects in welds.

5.19 List the reasons for the above.
5.20 Explain non-destructive testing of welds.
5.21 List various (special) modern welding techniques.
5.22 State the principle of at least four modern welding techniques.
5.23 Explain the principle of TIG and MIG welding.

COURSE CONTENT

1.0 Lathe and Lathe Work

1.1 Working Principle of Lathe
1.2 Types of Lathes - Engine lathe – construction details–specifications.
1.3 Nomenclature of single point cutting tool, geometry , tool signature, functions of tool angles.
1.4 General and special operations – (Turning, facing, taper turning thread cutting, knurling, forming, drilling, boring, reaming, key way cutting.)
1.5 Methods of taper turning – explanation
1.6 Lathe accessories viz., work holding devices and tool holding devices
1.7 Turret lathe: sketch – operation – advantages.
1.8 Capstan lathe: sketch – operation – advantages.
1.9 Comparison of engine (centre lathe) – turret – capstan lathe.
1.10 Semi automatic lathe – features.
1.11 Automatic lathe – features.
1.12 Copying lathe – applications.

2.0 Shaping, Slotting, and Planning

2.1 Introduction to shaper, slotter, planer.
2.2 Constructional details and specifications of shaper, slotter and planer.
2.3 Operations on these machines.
2.4 Tools and materials.
2.5 Driving mechanisms - quick return arrangement - crank & slotted lever mechanism, whit worth mechanism, hydraulic drive.

3.0 Broaching Machines

3.1 Introduction to broaching.
3.2 Types of broaching machines – horizontal type (single ram & duplex ram) vertical type, pull up, pull down, and push down.
3.3 Elements of broach tool, broach teeth details – nomenclature – types – tool material.

4.0 Cutting Fluids, Coolants & Lubricants

4.1 Introduction.
4.2 Types of cutting fluids.
4.3 Properties and functions of fluids and coolants.
4.4 Fluids and coolants required in turning, drilling, shaping, sawing & Broaching.
4.5 Selection of cutting fluids, methods of application of cutting fluid.
4.6 Classification of lubricants (solid, liquid, gaseous)
4.7 Properties and applications of lubricants.

5.0 Welding

5.1 Introduction.
5.2 Classification of welding processes.
5.3 Advantages and limitations of welding.
5.4 Principles of arc welding.
5.5 Arc welding equipment.
5.6 Choice of electrodes for different metals.
5.7 Principle of gas (oxy – acetylene) welding.
5.8 Equipment of gas welding.
5.9 Welding procedures (arc & gas)
5.10 Soldering and Brazing techniques.
5.11 Types and applications of solders & fluxes.
5.12 Various flame cutting processes.
5.13 Advantages and limitations of flame cutting.
5.14 Defects in welding.
5.15 Testing and inspection.
5.16 Modern welding methods, (Submerged, CO_2, Atomic – Hydrogen, ultrasonic welding),
5.17 Brief description of MIG & TIG Welding.

REFERENCE BOOKS

1. Welding Technology by Little.
2. Elements of Work Shop Technology vol. I & II by Hazra Choudry
3. Engineering Metrology by Jain
4. Welding Technology by Parmar
5. Manufacturing Technology (volume-1) by P.N.Rao (MGH Pub)

MACHINE DRAWING PRACTICE

Subject Title : Machine Drawing Practice
Subject Code : ME-307
Periods/ Week : 07
Periods/Semester : 105

TIME SCHEDULE

S.No	Major Topics	Periods	Weightage of Marks	Short answer Questions	Essay type Questions
1	Introduction	12	-	-	-
2	Fastening Devices	21	10	02	-
3	Assembly Drawings	42	80	-	02
4	Piping Layouts and Joints	18	05	01	-
5	Welding Fabrication Drawings	12	05	01	-
	Total	**105**	**100**	**04**	**02**

Note:- Candidate has to answer all questions in part- A and one question out of two in part- B

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the importance of machine drawing

1.1. Explain the importance of Machine drawing.
1.2. Review of 1st angle and 3rd angle Projections
1.3. Review of Orthographic Projections and Sectional Views.

2.0 Practice the drawing of fastening devices

2.1. Draw the standard thread profiles.
2.2. Draw bolted connections to standard proportions.
2.3. Draw different types of screws.
2.4. Draw different types of rivets and riveted connections.
2.5. Draw different types of keys and cotters.

3.0 Understand the assembly drawing practice and procedure

3.1. List the sequence of steps for preparing assembly drawing.
3.2. Practice the assembly drawing for the given components drawing.
3.3. Prepare the list of parts.

4.0 Practice the construction piping layouts

4.1. State the distinction between pipes and tubes.
4.2. Identify the common components of a piping layout.
4.3. Identify the conventional symbols used for the various components of piping layout.
4.4. Prepare single line and double line diagrams of piping layouts.
4.5. Draw the assembly drawing and sectioned views of pipe joint.
4.6. Explain the use of packing material in joint.

5.0 Appreciate the welded fabrication drawing.

5.1. Identify the different types of welds and their symbolic representation as per B.I.S., SP-46-1988.
5.2. Identify the elements of welding symbol and their standard location on the symbol.
5.3. State welding process to be used, surface contour and finish of weld when given in symbolic form.
5.4. Practice the Preparation of working drawing of welded fabrications.

Key competencies to be achieved by the student

Topic	Key competency
Introduction	• Understand the difference between I & III angle projections • Appraise the importance of sectional views in Mechanical Engineering
Fastening devices	• Differentiate the temporary and permanent joints and their applications • Draw the bolts, screws, nuts, rivets, keys and cotters with standard proportions
Assembly drawing	• Read the external and internal features of each part • Prepare the table of parts giving part number, its name, material and quantity
Piping layouts	• Acquaint with the symbols used for the various components of piping layout • Understand the importance and use of all the valves and packing material used in pipe fittings
Welded fabrication drawing	• Specify the weld joint • Prepare the working drawing of welded fabrications.

COURSE CONTENT

1.0 Introduction

1.1. Importance of Machine Drawing.
1.2. Brief revision of 1st and 3rd angle projections
1.3. Understand the concepts of Orthographic projections and Sectional views.

2.0 Fastening Devices

2.1. Temporary and Permanent fastenings and their areas of application-thread nomenclature, forms of screw thread profiles, metric, B.A., Acme, Knuckle, etc.
2.2. Bolts and Nuts: Specification of bolts and nuts, Different types of bolted joints (like using through bolts, studs, screws etc.,) in different applications. Purpose of lock nuts and their Types.
2.3. Keys and cotters: Types of keys and cotters: Difference between key and cotter uses.
2.4. Rivets and Riveted joints: Types and proportions and specification of rivets: Different types of riveted joints: Lap, butt-single row, double row etc., chain and zigzag riveting – calculation of diameter of rivet: Pitch and arrangement of rivets in row – use – of standard proportions.

Drawing Plate: 1

1. Exercise on Orthographic projections and Sectional views.
2. Thread Nomenclature and forms of screw thread profiles.
3. Exercises in drawing – bolted connections using standard proportions.
4. Drawing of various types of lock nuts & types of keys indicating their proportionate dimensions.
5. Exercise in drawing riveted joints using standard proportions: Single row, double row (chain and zigzag) in lap and butt joints (single & double strap).

3.0 Assembly Drawings

3.1. Need and functions of assembly and detailed drawings.
3.2. Steps in preparing assembly drawings.
3.3. Bill of materials and parts list.
3.4. Exercises in preparing assembly drawings of commonly available engineering components.

Drawing Plate: 2

Draw the views / sectional views of

1. Jib and cotter joint assembly
2. Knuckle joint assembly
3. Assembly of muffs coupling (sold & split) coupling
4. Screw jack assembly,
5. Stuffing box.
6. Bearings.

NOTE: **With the knowledge gained by the above exercises the students shall be able to draw exercises on Socket and spigot joint, protective type flanged coupling, piston of petrol engine, cross head, connecting rod, eccentric, flexible coupling, universal coupling, sleeve and cotter joint, Oldham's-coupling, lathe tool post, big end of a connecting rod, foot step bearing, Plummer block, lathe tail stock.**

4.0 Piping layouts

4.1. Classification of pipes and tubes.
4.2. Components of pipes lay-out.
4.3. Screw fitting bend, elbow, tee, lateral Cross-nipple, reducing socket and plug.
4.4. Unions: Screwed ground and flanged.
4.5. Valves: Gate valve: angle valve, check valve.
4.6. Various conventional symbol used for the above components.

Drawing Plate: 3

1. Single line diagram of pipe layout two exercises.
2. Double line diagram of pipe layout one exercise.
3. Cast iron flanged pipe joint, spigot and socket joint, hydraulic pipe joint, expansion joint, screwed joint, union joint - draw half sectional elevation and end view.

5.0 Welded fabrication drawings

5.1. Different types of weld and their basic symbols including sectional representation as per table of I.S. standards, fillet, square butt, single V-Butt, double V-Butt, single bevel butt, double bevel butt, stud, bead (edge or seal) spot, seam.
5.2. Elements of welding symbol and their standard location the symbol as per IS standards reference Kode arrow head, weld symbol supplementary symbol dimensions of welds, method of welding process, special reference.

5.3. Significance of arrow & position of arrow head significance of reference line as per I.S. standards with reference to fillet, V-Butt an stud welds.
5.4. Supplementary symbols and special instructions: surface of reference line; as per I.S. standards with reference to fillet, V-Butt an stud welds.
5.5. Dimensions of welds: length, location and spacing of welds as per I.S., B.I.S., standards with showing dimensions required on a welding.
5.6. Need of special reference

Drawing Plate: 4

1. Drawing tables and figs. Referred in the contents above taking form I.S. standards.
2. Dimensioning a given welding drawings as per I.S., SP-46-1988.
3. Preparing working drawing of welding fabrication from given data.

REFERENCE BOOKS

1. T.S.M & S.S.M in respect of Technical Drawing by TTTI, Madras
2. Machine Drawing by A.C. Parkinson.
3. Machine Drawing by Jones & Jones.
4. Machine Drawing by N.D. Bhat.
5. A text book for Technical Schools Engg. Drawing by N.C.E.R.T
6. Machine Drawing by R.B. Gupta.
7. Indian Standard Scheme of symbol for Welding by SP-46-1988.
8. Machine Drawing by Bhattacharyya (Oxford Publishers).
9. Machine Drawing by Ajeeth Singh (MGH Publishers)
10. Machine Drawing by N.Siddeswar, Kannaih, Sastri. (MGH Publishers)

FUELS LABORATORY PRACTICE

Subject Title : Fuels Lab Practice
Subject Code : ME – 308
Total No. of Periods : 03
Total Periods Per Semester : 45

TIME SCHEDULE

S. No.	Major Title	Periods
1.	Flash & Fire point tests	09
2.	Viscosity measurement	12
3.	Calorific value tests	12
4.	Carbon residue test	06
5.	Calibration of pressure gauge	06
	Total	**45**

OBJECTIVES
Up on Completion of the course the student shall be able to:

1.0 Understand the determination of flash and fire point of a given sample of fuel using given apparatus(Abels, Cleveland & Penesky martin)

2.0 Understand the determination of Viscosity of a given sample of oil using given apparatus

3.0 Understand the determination of Calorific value of a given sample of fuel using given apparatus

4.0 Understand the determination of amount of carbon residue of a given sample of petroleum product

.

5.0 Understand the need and importance of calibration of pressure gauges.

Competencies and KEY competencies to be achieved by the student

Title of the experiment (No.of periods)	Competencies	Key competency
1. Flash and Fire point tests		
a) Abel's Apparatus (3)	1. Handle the apparatus • Filling water • Fixing thermometer 2. Manipulate the apparatus • Checking heating element • Connecting regulator 3. Perform the precise operations • Observation of flame colour • Recording temperature 4. Explain the need and scope of the Experiment in industry	• Observe the flame for change in colour and type of flame • Record the temperature of fuel using thermometer
b) Cleveland Apparatus (3)	1. Handle the apparatus • Filling water • Fixing thermometer 2. Manipulate the apparatus • Checking heating element • Connecting regulator 3. Perform the precise operations • Observation of flame colour • Recording temperature	• Observe the flame for change in colour and type of flame • Record the temperature of fuel using thermometer
c) Penesky martin Apparatus (3)	1. Handle the apparatus • Filling water • Fixing thermometer 2. Manipulate the apparatus • Checking heating element • Connecting regulator 3. Perform the precise operations • Observation of flame colour • Recording temperature	• Observe the flame for change in colour and type of flame • Record the temperature of fuel using thermometer

Title of the experiment (No.of periods)	Competencies	Key competency
2. Viscosity measurement		
a) Redwood viscometer (6)	1. Handle the apparatus • Filling water • Fixing thermometer • Handle hydrometer 2. Manipulate the apparatus • Checking heating element • Connecting regulator • Checking hydrometer functioning 3. Perform the precise operations • Use Hydrometer to measure the density of given oil • Record the temperature of oil using thermometer • 3. Record the time to collect 50 ml of oil • Draw the graph between the temperature and viscosities	• Use Hydrometer to measure the density of given oil • Record the temperature of oil using thermometer • Record the time to collect 50 ml of oil
b) Saybolt viscometer(6)	1. Handle the apparatus • Filling water • Fixing thermometer • Handle hydrometer 2. Manipulate the apparatus • Checking heating element • Connecting regulator • Checking hydrometer functioning 3. Perform the precise operations • Use Hydrometer to measure the density of given oil • Record the temperature of oil using thermometer • 3. Record the time to collect 50 ml of oil 4. Draw the graph between the temperature and viscosities	• Handle the Hydrometer to measure the density of given oil • Record the temperature of oil using thermometer • Record the time to collect 50 ml of oil

Title of the experiment (No.of periods)	Competencies	Key competency
3. Calorific value tests		
a) Bomb calorimeter (6)	1. Handle the apparatus • Checking oxygen cylinder regulator & Water flow into equipment 2. Perform precise operations • Weigh the water collected & condensed steam • Record the inlet &outlet temperature of water • Record mass of fuel burnt • Determine the Calorific values of solid, liquid and gaseous fuels	• Weigh the water collected and condensed steam • Record the inlet &outlet temperature of water • Record mass of fuel burnt
b) Junkers gas calorimeter(6)	1. Handle the apparatus • Checking oxygen cylinder regulator & Water flow into equipment 2. Perform precise operations • Weigh the water collected & condensed steam • Record the inlet &outlet temperature of water • Record volume of gas burnt • Determine the Calorific values of solid, liquid and gaseous fuels	• Weigh the water collected and condensed steam • Record the inlet &outlet temperature of water • Record volume of gas burnt

Title of the experiment (No.of periods)	Competencies	Key competency
4. Carbon residue test (6)	1. Handle the apparatus • Checking heating element • Pouring of fuel oil sample • Placing of crucible in equipment 2. Perform precise operations • Weighing the porcelain crucible with and without oil • Measure the weight of carbon residue • Assess the percentage carbon residue	• Weigh the porcelain crucible with and without oil • Measure the weight of carbon residue
5. Calibration of pressure gauge (6)	1. Handle the apparatus • Checking oil leakage • Pouring sufficient oil 2. Perform precise operations • Operate screw pump to generate system pressure • Observe and record the pressure due to mass load • Record the gauge pressure	• Operate screw pump to generate system pressure • Observe and record the pressure due to mass load • Record the gauge pressure

COURSE CONTENT

1. Determination of flash and fire points of various fuels and lubricants using Abel's, Pensky Martin's, and Cleveland's apparatus.
2. Determination of Kinematics and Absolute viscosities of the fuel and lubricating Oils using Redwood & Saybolt viscometers.
3. Determination of Calorific values of Solid and liquid fuels using Bomb calorimeter. and Determination of Calorific value of gaseous fuel by using Junker's calorimeter.
4. Determination of Carbon residue using Conradson's apparatus.
5. Calibration of a pressure gauge using dead weight pressure gauge tester

ELECTRICAL ENGINEERING LABORATORY PRACTICE

Subject Title : Electrical Engineering Lab Practice
Subject Code : ME-309
Periods/Week : 03
Periods/Year : 45

TIME SCHEDULE

S. No.	Major Topics	No. of Periods(3 periods per Session)
1	Network Laws & Theorems	12
2	Calibration of meters	06
3	Measurement of Power	06
4	Speed control of DC Motor	06
5	Brake test on 3-phase squirrel cage induction motor	03
6	Identification of components	06
7	Earthing and Safety	06
	TOTAL	45

OBJECTIVES

Upon the completion of the practice the student shall be able to

I Verify Network Laws & Theorems

II Calibrate the different meters

III Measure Power in DC and AC circuit

IV PerformSpeed control of DC Shunt Motor by

V Conduct Brake test on 3-phase squirrel cage induction motor.

VI Identify the various components

VII Demonstrate Earthing and Safety

Safety Precautions
General Safety Precautions to be observed by the student for all Electrical laboratory Practices

1. Every student has to bring insulated tool kit and follow the general safety precautions throughout the lab sessions
2. Whenever handling/using a meter check for 'zero' position of the pointer and adjust for 'zero' position if there is any deviation

Competencies and key competencies to be achieved by the student

Title of the experiment (No.of periods)	Competencies	Key competency
1. Network Laws & Theorems		
a)Verify Ohm's Law (3)	•	•
b)Verify the limitations of Ohm's law (3)	•	•
c)Verify Kirchoff's current Law (3)	•	•
d)Verify Kirchoff's Voltage law (3)	•	•

Title of the experiment (No.of periods)	Competencies	Key competency
2. Calibrate the different meters		
a) Calibrate Dynamometer type of wattmeter (3)	•	•
b) Calibrate single phase Energy meter (3)	•	•
3. Measure Power in DC and AC circuit		
a) Measure power across a Resistor using voltmeter and ammeter when connected across a DC supply (3)	•	•
b) Measure power and Power factor in 1 - Ø inductive circuit by using Wattmeter, Volt meter and Ammeter when connected across an AC supply (3)	•	•

Title of the experiment (No.of periods)	Competencies	Key competency
4. PerformSpeed control of DC Shunt Motor by		
a) Rheostatic control method (3)		
b) Field control method (3)		
5. Conduct Brake test on 3-phase squirrel cage induction motor.		
a) Conduct brake test on 3-phase squirrel cage induction motor (3)		

Title of the experiment (No.of periods)	Competencies	Key competency
6.Identification of components		
a) Identify resistors based on their colour code. b) Identify capacitors based on their colour code. c) Identify diodes with their rating d) Identify Zener diode. e) Identify the type of transistor (NPN or PNP) and their terminals (C,E,G). (6)		
7. Earthing and Safety (6)		
a) Demonstrate Pipe Earthing b)Demonstrate Plate Earthing c) Demonstrate Procedure of first aid on Electric shock.		

COURSE CONTENT

(I) Network Laws & Theorems
Ohm's Law - limitations of Ohm's law-. Verification of Ohms Law - Kirchoff's current Law- Kirchoff's Voltage law -Super position theorem-Thevenins theorem

(II) Calibration of meters
Dynamometer type of wattmeter-Single phase Energy meter

(III) Measurement of Power
Across a Resistor in DC circuit- Across an Inductive circuit in an AC circuit.

(IV) PerformSpeed control of DC Shunt Motor by
Rheostatic control method - Field control method

(V) Brake test on 3-phase squirrel cage induction motor.
Conduct Brake test on 3-phase squirrel cage induction motor.

(VI) Identify the various components
Identify the various components- Resistors,Capacitors,Diode, Zener Diode,Transistor.

(VII) Earthing and Safety.
Demonstrate Pipe Earthing-Plate Earthing-First aid.

MANUFACTURING AND FABRICATION ENGINEERING LAB PRACTICE-I

Subject Title : **Manufacturing and Fabrication Engg.Lab Practice-I**
Subject Code : **ME – 310**
Periods per Week : **03**
Periods per Semester : **45**

OBJECTIVES
Up *on the completion of the course the student shall be able to:*

1.0 Practice the casting principles and operations in foundry
- 1.1 Write the sand moulding procedures in foundry.
- 1.2 Prepare a mould sand mix.
- 1.3 Identify various tools used in foundry shop.
- 1.4 Prepare mould in two boxes, three boxes.
- 1.5 Prepare a mould ready for casting with proper provision for runners, risers and gates
- 1.6 Place the cope over the drag without any mismatch
- 1.7 Prepare the molten metal and calculate the amount of metal to be poured in the mould

2.0 Practice the operation of Lathe
- 2.1 Perform a plain turning operation on a lathe machine.
- 2.2 Select proper tool to perform the job.
- 2.3 Centre the job by dial gauge
- 2.4 Select the suitable speed for different operations
- 2.5 Use various measuring instruments for taking dimensions.
- 2.6 Perform step turning operation on lathe.
- 2.7 Calculate the taper angle.
- 2.8 Practice different taper turning methods on lathe
- 2.9 Turn the required tapers by swivelling the compound rest.
- 2.10 Produce articles of industrial application such as ring gauges, plug gauges, handle etc.

3.0 Practice the joining of metals in Arc Welding
- 3.1 Prepare the edges for welding
- 3.2 Select the suitable electrode, voltage and current
- 3.3 Handle the Electrode Holder for laying welding beads.
- 3.4 Operate the welding transformer and generator.
- 3.5 Perform various weld joint operations.

KEY competencies to be achieved by the student.

Title of the experiment	Key competency
Moulding and Casting of solid bearing	– Select the suitable sand and mix it for the mould – Cut gates and runners – Pour sufficient quantity of molten metal
Moulding and Casting of flange coupling	– Prepare and place the core – Cutt the gates and runners – Pour the sufficient quantity of molten metal
Moulding and Casting of split bearing	– Prepare and place the core – Cutt the gates and runners – Pour the sufficient quantity of molten metal
Moulding and Casting of connecting rod	– Prepare and place the core – Cutt the gates and runners – Pour the sufficient quantity of molten metal
Moulding and Casting of V-pulley	– Cut gates and runners – Pour sufficient quantity of molten metal
Moulding and Casting of Gear pulley	– Cut gates and runners - Pour sufficient quantity of molten metal
Plain turning	- Check the centering of the work piece using dial gauge - Fix the cutting tool at proper inclination - Select the suitable speed, feed and depth of cut for rough and finishing operations - Check the dimensions
Step turning	• Check the centering of the work piece using dial gauge • Fix the cutting tool at proper inclination • Select the suitable speed, feed and depth of cut for rough and finishing operations • Check the dimensions
Taper turning	• Check the centering of the work piece using dial gauge • Fix the cutting tool at proper inclination • Select the suitable speed, feed and depth of cut for rough and finishing operations • Check the dimensions • Rotate the compound rest to the suitable angle

Title of the experiment	Key competency
Collar turning	• Check the centring of the work piece using dial gauge • Fix the cutting tool at proper inclination to turn the work piece • Select the suitable speed, feed and depth of cut for rough and finishing operations • Check the dimensions
Knurling	• Check the centring of the work piece using dial gauge • Fix the cutting tool at proper inclination to turn the work piece • Select the suitable speed, feed and depth of cut for rough and finishing operations • Check the dimensions • Fix the knurling tool and selecting the suitable speed and feed
Welding Layout of beads	• Perform Edge preparation • Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc • Check the bead
Lap joint	• Perform Edge preparation • Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc • Check the bead
Butt joint	• Perform Edge preparation • Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc • Check the bead

COURSE CONTENT

1 Foundry

Moulding and casting of

1.1 Solid bearing
1.2 Flange coupling
1.3 Split bearing
1.4 Connecting rod
1.5 V – Pulley
1.6 Gear pulley

2 Machine Shop (Turning)

2.1 Plain Turning
2.2 Step Turning
2.3 Taper Turning
2.4 Turning Collars
2.5 Knurling
2.6 Facing

3. Welding

3.1 Layout of Beads
3.2 Butt joints.
3.3 Lap joints.

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical/Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
ME - 401	Mathematics - III	4		60	3			100
ME - 402	Design of Machine Elements-I	4		60	3			100
ME - 403	Industrial Engineering	4		60	3			100
ME - 404	Heat Power Engineering-I	5		75	3			100
ME - 405	Fluid Mechanics & Hydraulic Machinery	5		75	3			100
ME - 406	Production Technology -I	4	-	60	3			100
PRACTICAL:								
ME - 407	Production Drawing Practice	-	7	105	3			100
ME - 408	Communication Skills Practice	-	3	45	3			100
ME - 409	Material Testing Lab Practice	-	3	45	3			100
ME - 410	Manufacturing & Fabrication Engg. Lab Practice -II	-	3	45	3			100
	TOTAL	26	16	630				1000

ENGINEERING MATHEMATICS – III
(Common to all Branches)

Subject Title : Engineering Mathematics-III
Subject Code : ME-401
Periods per week : 04
Periods per Semester : 60

Blue Print

S. No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
	Unit -I Differential Equations			**R**	**U**	**App**	**R**	**U**	**App**
1	Homogenous Linear Differential equations with constant coefficients	05	06	2	0	0	0	0	0
2	Non-homogenous Linear Differential equations with constant coefficients	10	23	0	1	0	1	1	0
	Unit - II								
3	Laplace Transforms	20	32	1	2	1	1	0	1
	Unit - III								
4	Fourier Series	13	26	1	1	0	0	1	1
	Unit - IV								
5	Probability	12	23	1			1/2	1/2	1
	Total	60	110	5	4	1	2 1/2	2 1/2	3
			Marks	15	12	3	25	25	30

R: **Remembering type** 40 marks
U: **Understanding type** 37 marks
App: **Application type** 33 marks

OBJECTIVES

Upon completion of the course the student shall be able to

Unit-I

Differential Equations

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

1.1 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, complex.

1.2 Solve the higher order homogeneous differential equations with constant coefficients.

2.0 Solve Non Homogeneous linear differential equations with constant coefficients in engineering situations

2.1 Explain the concept of complementary function, particular Integral and general solution of a differential equation.

2.2 Solve n^{th} order differential equation of the type $f(D)\ y = X$ where $f(D)$ is a polynomial of nth order and X is a function of the form $k, e^{ax}, Sinax, Cosax, x^n$.

Unit-II

3.0 Use Laplace Transforms to solve differential equation in engineering problems

3.1 Write the definition of Laplace Transform and Laplace transform of standard functions.

3.2 Explain the sufficient conditions of existence of Laplace Transform.

3.3 Write the properties of Laplace Transform – Linear property, First shifting property, Change of Scale.

3.4 Solve simple problems using the above properties

3.5 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^{(n)}(t)$, $\int_0^t f(u)\,du$ interms of Laplace transform of $f(t)$.

3.6 Solve simple problems using the above formulae.

3.7 Define unit step function and write the Laplace Transform of unit step function.

3.8 Write second shifting property.

3.9 Define inverse Laplace Transform and write inverse Laplace Transform of standard functions.

3.10 Solve simple problems on 3.9

3.11 Write first shifting property of inverse Laplace Transfrom.

3.12 Solve simple problems on 3.11

3.13 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions mentioned in section 3.5

3.14 Solve simple problems on 3.13.

3.15 Define convolution of two functions and state convolution theorem.

3.16 Solve simple problems on 3.15.

3.17 Use Laplace and inverse Laplace Transforms to solve simple differential equations of second order.

Unit-III

4.0 Know Fourier Series expansion of functions

4.1 Define the orthogonality of functions in an interval.

4.2 Define Fourier series of a function on the interval $(c,\ c+2\pi)$ and write the Euler's formulae for determining the Fourier coefficients.

4.3 Write sufficient conditions for the existence of Fourier series for a function.
4.4 Find Fourier series of simple functions in the range $(0, 2\pi)$, $(-\pi, \pi)$.
4.5 Write Fourier series for even and odd functions in the interval $(-\pi, \pi)$.
4.6 Write Fourier series expansion of a function over the interval $(-l, l)$
4.7 Write half range Fourier sine and cosine series of a function over the interval $(0, l)$
4.8 Solve simple problems on 4.5, 4.6 and 4.7

Unit-IV

5.0 Understand the basic concepts of Probability

5.1 Recall sets, operations on sets and Venn-diagrams.
5.2 Explain the terminology – random experiment, outcome, sample space, elementary event and event.
5.3 Define Probability – Empirical approach and axiomatic approach (Mathematical).
5.4 Prove addition theorem of probability for two mutually exclusive and exhaustive events.
5.5 State addition theorem of probability for three mutually exclusive and exhaustive events.
5.6 Solve simple problems on addition theorem.
5.7 Explain dependent, independent events and conditional event.
5.8 State the formula for conditional probability.
5.9 State multiplication theorem of probability.
5.10 State Bayes' theorem.
5.11 Solve simple problems on conditional probability and Bayes' theorem.

COURSE CONTENT

Differential Equations

1. Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.
2. Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X

where X is in the form k, e^{ax}, sin ax, cos ax, x^n, (n= 1,2) – complimentary function, particular integral and general solution.

Laplace Transforms(LT)

3. Definition, sufficient conditions for existence of LT, LT of elementary functions, linearity property, scale change property, first shifting property, multiplication by t^n, division by t, LT of derivatives and integrals, unit step function, LT of unit step function, second shifting theorem, inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s – examples of inverse LT using partial fractions – convolution theorem (no proof) – applications of LT to solve ordinary differential equations with initial conditions (2^{nd} order only)

Fourier Series

4. Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c, c+2\pi)$, Euler's formulae , sufficient conditions for existence of Fourier series for a function, even, odd functions and their Fourier series over the interval $(0, 2\pi)$, Change of length of interval – Fourier series , half range series.

Probability

5 Review of sets, operations on sets and Venn-diagrams; random experiment, outcome, sample space, elementary event and event, equally likely events, Definition of Probability – Empirical approach and axiomatic approach (Mathematical), addition theorem of probability for two mutually exclusive and exhaustive events, extension of addition theorem for three mutually exclusive and exhaustive events, dependent, independent events and conditional event, probability of a conditional event, multiplication theorem, Bayes' theorem.

Reference Books

1. Higher Engineering Mathematics, B.V.Ramana, Tata McGraw-Hill
2. Probability, 2/e Schaum's Outlines Series, McGraw-Hill
3. Elementary Probability and Statistics, by S.C.Gupta and V.K.Kapoor

DESIGN OF MACHINE ELEMENTS- I

Subject Title : Design of Machine Elements - I
Subject Code : ME – 402
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1.	Introduction, Principal stresses & Theories of failure	12	21	02	1 1/2
2.	Bolted Joints	12	21	02	1 1/2
3.	Riveted Joints and Welded Joints	11	23	01	02
4.	Shafts, Keys and Couplings	15	29	03	02
5.	Bearings	10	16	02	01
Total		**60**	**110**	**10**	**08**

OBJECTIVES

Up on completion of the course the student shall able to

1.0 Understand the concept of mechanical engineering design

1.1 Explain the basic requirements of design.
1.2 Explain the phases of design process
1.3 List the factors governing design.
1.4 Use relevant Indian Standard Codes
1.5 Derive the expressions for normal and shear stresses on any plane subjected to combined loading
1.6 Derive the expressions for principal stresses
1.7 Solve the simple numerical problems
1.8 Explain the importance of principal stresses in machine design
1.9 Explain the importance of theories of elastic failure in machine design
1.10 Write the statements and equations of theories of elastic failure (05) without derivation

2.0 Understand the design of Bolted Joints and power screws

2.1 Explain screw thread nomenclature and specifications of screw threads
2.2 List the different threaded fasteners with legible sketch
2.3 Explain power screw mechanism with legible sketch
2.4 Derive an expression for the torque required to raise and lower a load in a power screw
2.5 Derive an expression for the efficiency and self locking of power screw
2.6 Explain the strength of screwed fasteners
2.7 List the stresses in bolts
2.8 Design the size of bolt for a given load requirement.

2.9 Design the size of eye bolt for a given load requirement
2.10 Draw an eye bolt (not to scale) showing the proportions
2.11 Solve numerical problems related to the above cases

3.0 Understand the design of Riveted Joints and Welded Joints

3.1 List the basic types of riveted joints with legible sketch
3.2 Explain the terms used in riveted joints
3.3 List the types of failures in riveted joints
3.4 Evaluate the strength of a riveted joint
3.5 Design a riveted joint under the given conditions (E.g.Direct loading)
3.6 Explain the concept of Diamond or Lozenge joint
3.7 Design the diamond (structural) joint
3.8 List the types of welded joints
3.9 List the welded symbols with legible sketch
3.10 Explain the terms related to welded joints
3.11 List the merits and demerits of welded joints
3.12 Explain the lap and butt joints with legible sketch
3.13 Design the welded joints subjected to simple loading
3.14 Solve the numerical problems related to the above cases

4.0 Understand the design of Shafts, Keys and Couplings

4.1 Define the terms shaft and axle
4.2 State the functions of shaft
4.3 List the types of shafts
4.4 Distinguish between the shaft and axle
4.5 List the standard sizes of shafts as per I.S
4.6 Write the formula for power transmitted by the shaft
4.7 Design the shaft subjected to only torsion
4.8 Design the shaft subjected to only bending load(Design of axle)
4.9 Design the shaft subjected to bending and torsion based on Rankine and Guest theories
4.10 Design the shaft against the rigidity
4.11 Compare the strength and rigidity of solid and hollow shafts
4.12 Explain the function of keys and splines.
4.13 Name the recommended materials used for keys and splines.
4.14 Design the keys based on different modes of failure and also based on empirical relations
4.15 Write all the proportions of a spline for a given application referring tables.
4.16 Write the specifications of parallel, gib-head and taper sunk keys as per B.I.S.
4.17 Explain the function of a coupling
4.18 Classify the couplings
4.19 Design the muff coupling for a shaft of given size using empirical relations.
4.20 Design the cast iron flange-coupling (rigid type) for a given torque
4.21 Draw the above couplings according to the standard specifications

5. Understand the design of Bearings

5.1 State the function of bearing
5.2 Classify the bearings
5.3 List the types of lubrication
5.4 Explain the construction and working principle of journal bearing
5.5 Explain the nomenclature of roller bearing
5.6 List the types of roller bearings
5.7 List the types of thrust bearings
5.8 List the Advantages and disadvantages of sliding contact bearings
5.9 List all the differences between sliding contact and roller bearings

5.10 Explain about the bearing material
5.11 Define the terms- Rating life, Bearing load, Basic load rating and equivalent radial load
5.12 Select a bearing for given loads using tables
5.13 List all the advantages and disadvantages of anti-friction bearings
5.14 Derive the expressions for the load and torque carried by thrust and collar bearings under uniform pressure and wear conditions
5.15 Design a simple journal bearing using McKee's equation
5.16 Calculate heat generated and dissipated in journal bearing
5.17 Calculate heat generated and dissipated in collar bearing based on uniform pressure and uniform wear conditions
5.18 Specify a bearing
5.19 Solve the numerical problems

COURSE CONTENT

1. Introduction

Design philosophy, Derivation of normal and shear stresses an an inclined plane, Derivation of principal stresses and their importance. Theories of elastic failure- Definition and their mathematical statement.
Factors governing the design of machine element - nature of load, working stress, mechanical properties of the material of the product, process of manufacture, reliability, durability, Cost, life of product and safety.
Design procedure: General sequence of steps in designing a machine element.
Need of standard data for design purpose, use of machine design data, hand books and other data manuals.

2. Bolted Joints

Revision of nomenclature, form of threads – specifications.
Strength of screwed fasteners and failure of bolts due to different reasons
Types of screw fasteners, Self - locking and efficiency of screw
Stresses due to initial tightening and stresses due to external forces
Stress due to combination of forces – Stresses due to shear loads application
Design of Nut – Hexagonal and square shapes only.
Design of eye bolt for a given load and sketching - using empirical proportions, Applications of eye-bolt and Numerical problems

3. Riveted joints and Welded Joints

Types of Riveted joints; Caulking and Fullering;
Types of failures; Terms related to joints, Modes of failure of riveted joint
Strength equations; Efficiency of joints; Simple problems on lap joints and butt joints;
Concept of Diamond or Lozenge joint: Simple problems.
Types of Welded joints; Advantages and disadvantages over other joints;
Terms related to weld; strength equation;
Calculation of strength of welded joints (problems on eccentric loading are omitted)
Numerical problems.

4. Shafts, Keys and Couplings

shafts

Function of shafts and materials used for shafts
Standard sizes of shafts as per I.S, Types of shafts.
Design of diameters for solid and hollow shafts to transmit a given power at given rpm.,
a) based on strength
b) based on rigidity.

Comparison of solid and hallow shafts
Design of axle.
Numerical problems

keys
Function of keys and splines, Specification of splines.
Materials of keys and splines.
Discussion over nature of failure of key-effect of key way and the shaft strength.
Design of a rectangular sunk key considering its failure against shear and crushing – given the power transmitted by the shaft and rpm.
Design of rectangular sunk key using empirical proportions for given diameter of the shaft. Check for strength.
Proportions of a spline for a given application using tables.

Couplings : Function of coupling & types of couplings.
Calculation of proportions of a muff coupling (solid) for a given shaft size using empirical formulae, sketching the same from the computed dimensions.
Rigid flange coupling : Calculation of dimensions for a C.I. flange coupling and coupling bolts for a given torque using empirical proportions – Sketching the flange coupling with the computed dimensions.
Numerical problems and sketching.

5. Bearings
Functions, Types of bearings
Journal bearing – terminology, McKee's Equation, Bearing Modulus
Friction in journal bearing, Friction circle, power lost in friction at a bearing
Thrust bearing- Power lost in friction, flat pivot and flat collar under conditions of uniform intensity of pressure and wear
Rolling contact bearings – advantages and disadvantages
Components of rolling contact bearing, Rating life of roller bearing, Static load carrying capacity, Dynamic load carrying capacity, Equivalent radial load-Life relationship(No derivations), Foot step and collar bearings
Market or commercial specifications of ball and roller bearings as per BIS standards

REFERENCES

1. Design of Machine Elements - Abdulla Shariff.
2. Machine Design - R.S.Khurmi.
3. Design of Machine Elements - Pandya and Shah.
4. Theory of machines- Thomas Bevan.
5. Machine Design – R.K. Jain
6. Design of Machine Elements – V B Bhandari (MGH Publishers)

INDUSTRIAL ENGINEERING

Subject Title : Industrial Engineering.
Subject Code : ME-403
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1.	**Work Study**				
	A. Method Study	12	26	02	02
	B. Work Measurement	12	21	02	11/2
2.	Job Evaluation & Merit Rating	10	16	02	01
3.	Wage & Incentive Systems	10	21	02	11/2
4.	Inspection and S.Q.C.	16	26	02	02
Total		60	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 A. Understand the principle of work study

1.1 Apply method study to a given situation.
1.2 State the steps involved in method study.
1.3 Identify the elements of chart used in method study.
1.4 Assemble the elements with symbols to form the required chart.
1.5 State the question in their order to analyse the operational sequence.
1.6 Analyse the question to form the best sequence.
1.7 Conclude the best sequence
1.8 Draw modified chart.

B. Understand the work measurement techniques

1.9 State the purpose of work Measurement.
1.10 Describe the time – study Equipment.
1.11 Describe the sequence of making Time – study.
1.12 State the rules for elemental Break down
1.13 State the procedure of recording the Time.
1.14 Explain the need for rating factor.
1.15 Compute normal time.
1.16 Explain the importance of Allowances.
1.17 Compute the standard time for an operation using observed time.
1.18 State the advantages of PMTS (Predetermined Motion Time Standards).
1.19 Compute standard time using PMTS data.
1.20 State the purpose of work – sampling.

1.21 State the advantages of work – sampling.
1.22 Describe the method of conducting work – sampling.
1.23 Draw conclusion from work sampling.

2.0 Understand the job evaluation & merit rating

2.1 Define job evaluation
2.2 State the purpose and procedure of job evaluation
2.3 Explain the job analysis, job description and jobs specification
2.4 Explain the methods of job evolution
  a) Ranking Method
  b) Classification Method
  c) Factor comparison Method
  d) Point Rating method
2.5 State the advantages and disadvantages of above methods
2.6 Define the merit rating
2.7 State the purpose of merit rating
2.8 Explain the methods of merit rating
  a) Rating Scale method
  b) Check list method
  c) Employee comparison method
2.9 State the advantages and disadvantages of merit rating.

3.0 Understand the wage systems existing in industry.

3.1 State the types of wages.
3.2 Define the terms base wage, production bonus.
3.3 State the different incentives.
3.4 Outline the standard wage plans such as Halsey, Rowan, Emerson, Taylor's differential piece rate system
3.5 State the incentives for supervisor and executives.
3.6 Solve problems in calculating wages under different wage plans.

4.0 Understand inspection procedures & the quality control functions.

4.1 Distinguish between the terms quality of design and quality of manufacturing.
4.2 Discuss quality – cost relationship.
4.3 Discuss quality variation parameters.
4.4 Explain inspection procedures.
4.5 State the different inspection methods.
4.6 Identify the difference between different methods of inspection.
4.7 State the advantages and limitations of the methods.
4.8 Define statistical terms.
4.9 State the meaning of above terms.
4.10 State the characteristics of normal distribution.
4.11 Apply normal distribution and use of its characteristics to construct control charts.
4.12 Construct control charts for variables and attributes.
4.13 Interpret control chart for "process in control" or "process out of control".
4.14 Decide the use of proper chart in given situation.
4.15 Apply the principles of "Random Sampling".
4.16 Identify the situation where Random Sampling is useful.
4.17 Compute the probability of acceptance for a given product.
4.18 Draw O.C. curve for single sampling plans.
4.19 Interpret required values for O.C. Curves.

COURSE CONTENT

Contribution of work study to productivity

1.0 Method Study.

Meaning and purpose.Process chart symbols- types.Operation process chart; method of Constructing. Flow process chart, its elements and Relational ship. Flow diagrams.

Other tools for method analysis.Analysing the charts and methods by questioning processes.Decisions for improving the Methods.Purpose, basic procedures.

Time study equipment – stop watch, study board, time study forms. Making time study, checking the methods, break down of the job – recording – selection of elements – measurement of time.

Time study – rating – average rating – normal performances, factors affecting performances, rating scales, rating factor.

Allowance to be considered in determining standard time – determination of standard time. Predetermined motion time standard, Standard data, uses of the standard data.

Work sampling; work sampling procedure – Purpose – collection of data – determination of the results.

2.0 Job Evaluation & Merit Rating

Job evaluation – definition, objectives and procedure, job analysis Job description and Job specification.

Methods of Job Evaluation – Ranking, classification, factors comparison and point rating methods.Merit rating – definition and objectives, Methods of merit rating – rating scale, check list and employee comparison methods, advantages and disadvantages of merit rating

3.0 Wage Systems.

Wages – definition, types – wage differentials – reasons, Methods of wage payments, Types of incentives, standard wage plans – Halsey, Weir, Emersons, Rowan's Gantt's task and Bonus systems, - Taylor's piece rate system, Merric's piece rate system – Numerical problems on the above plans, Incentives to the supervisor and executives.

4.0 Inspection and Statistical quality control - Inspection

Introduction – meaning of the term quality, quality of design, quality conformance & quality assurance- quality & cost relationship, reliability, Inspection – definition-objectives of inspection - methods of inspection – floor or patrolling inspection & centralised inspection – merits, demerits-kinds of inspection – trial run inspection-first piece inspection - pilot piece inspection - operation inspection - sample inspection, notional inspection -final inspection - working inspection. Review of statistical terms-Quality control-measurable & non-measurable, Variation in manufacture-assignable causes - chance causes-inspection, causes-variables-attributes-tally sheet frequency table histogram- frequency polygon-Normal curve-properties of normal curve.

Control chart for variables

Average and grand average – their significance determination of upper and lower

control limits of X and R using statistical tables, construction of X and R charts for a group of samples. Analysis of control charts – process out of control, and in control' Thumb rules for analysis – shifts, runs, trends, erratic fluctuations.

Control chart for attributes – fraction defective - percent defective - P,NP, 100P charts – significance – characteristics of X and R charts – calculation of P from data – control limits -process 'in control ' and 'out of control' – differences between P,NP and 100P charts.

Sampling procedure lot,Meaning of the term- lot - lot quality, lot size, sample size and acceptance number – lot sampling.

Probability of acceptance - producer's risk - consumers' risk LTPD, AOQ and AOQL.

Single sampling plan - Parameters that affect the lot size and sample size and acceptance number – effect of sample size and acceptance number on Probability of acceptance (Pa) - 'OC' curves of a single sampling plan – calculation of Pa - Double sampling plan - Variables involved in double sampling plan – Calculation of Pa.

A B C standard. Problems using tables.

REFERENCE BOOKS

1. Work study – by Ralph Banes.
2. Work study – by I.L.O.
4. Industrial Engineering & - Management Science - by T.R.Banga
5. S.Q.C – by Grant & Levenworth
6. S.Q.C -by Juran
7. S.Q.C -by Gupta

HEAT POWER ENGINEERING-I

Subject Title : Heat Power Engineering-I
Subject Code : ME-404
Periods/Week : 05
Periods per Semester : 75

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Air Standard Cycles	18	21	02	01½
2	Construction and working of IC Engines	08	16	02	01
3	Systems of IC Engines	16	26	02	02
4	Performance of IC Engines	06	10	-	01
5	Air Compressors	17	21	02	01 ½
6	Gas Turbines & Jet Propulsion	10	16	02	01
	Total	75	110	10	08

OBJECTIVES

Up on the completion of the course the student shall be able to

1.0 Appreciate the study of air standard cycles.

1.1 Define the term 'Air Standard cycle'
1.2 Define the term 'Reversible Cycle'.
1.3 Explain with a line diagram the Working of carnot cycle.
1.4 State the assumptions made in Carnot cycle.
1.5 Derive the formula for the air standard efficiency of a Carnot cycle.
1.6 Solve simple problems on Carnot Cycle.
1.7 Explain the working of Otto Cycle with help of a line diagram.
1.8 State the assumptions made in Otto Cycle.
1.9 Derive the formula for air standard Efficiency of Otto Cycle.
1.10 Solve simple problems on Otto Cycle.
1.11 Explain the working of a Diesel cycle with line diagrams.
1.12 State assumptions made in Diesel Cycle.
1.13 Derive the formula for Air Standard Efficiency of Diesel Cycle.
1.14 Solve the simple problems on Diesel Cycles.
1.15 State the reasons for Carnot cycle being highly efficient than any other cycle working between the same temperature limits.

2.0 Understand the construction and working of internal combustion engines.

2.1 Define "Heat Engine".
2.2 Classify heat engines.
2.3 Give examples for each type.
2.4 Summarise the advantages of internal combustion engines over external combustion engines.

2.5 Classify Internal Combustion Engines
2.6 Draw the legible sketch of an I.C. engines and name the various parts.
2.7 Explain with line diagram the working of a four-stroke diesel engine.
2.8 Explain with a line diagram the working of a two-stroke diesel engine.
2.9 Explain with a legible sketch the working of a four-stroke petrol engine.
2.10 Explain with a legible sketch the working of a two-stroke petrol engine.
2.11 Compare two stroke engines with four stroke engines.
2.12 Compare diesel engines with petrol engines.
2.13 Draw the valve time diagrams for two-stroke petrol and diesel engines also for four-stroke petrol and diesel engines.

3.0 Understand the systems of internal combustion engines.

3.1 Name the various elements of the fuel systems of diesel engine.
3.2 Explain with legible sketch the working of the elements of fuel system of diesel engine.
3.3 Name the various elements of the fuel system of a petrol engine.
3.4 Explain the functions of the elements of the fuel system in a petrol engine.
3.5 Explain with a line diagram the working of a simple carburettor.
3.6 Explain with a line diagram the working of a zenith carburettor.
3.7 State the methods of cooling in I.C. engine cylinders.
3.8 Explain with a legible sketch air – cooling in I.C. engine.
3.9 Explain with line sketch the working of water cooling system with thermo syphon method of circulation.
3.10 Explain with legible sketch the working of water – cooling system with a radiator and forced circulation.
3.11 Compare air cooling system with water – cooling system.
3.12 Name the ignition systems used in petrol engines.
3.13 Explain with line sketch the working of a battery – coil ignition system.
3.14 Explain with legible sketch the working of a magneto ignition system.
3.15 Compare the battery ignition system with magneto ignition system.
3.16 Name the different methods of lubricating systems in I.C. engines.
3.17 Explain with legible sketch the methods of lubricating systems in I.C. engines.
3.18 Name the different methods of governing I.C. engines.
3.19 Explain the hit and miss method governing of I.C. engines.
3.20 Explain the quality method of governing of I.C engines.
3.21 Explain with line sketch the quantity method of governing of petrol engines.
3.22 Explain the concept of super charging of I.C. engines.
3.23 List the objectives of super charging in I.C. engines.

4.0 Understand the performance of internal combustion engines.

4.1 Write the formula for brake power.
4.2 Write the formula for indicated powder.
4.3 Write the formula for Mechanical Efficiency.
4.4 Write the formula for Thermal Efficiency.
4.5 Write the formula for Relative Efficiency.
4.6 Explain the Heat balance sheet
4.7 Solve simple problems on the performance of I.C. engines using brake test data.

5.0 Comprehend the construction and working of air compressor.

5.1 State the functions of air compressors.
5.2 Enumerate the uses of compressed air.
5.3 Name the different types of compressors.
5.4 Explain with line diagram the working of a single reciprocating air compressor.

5.5 Write the formula for work done and power required by a single stage compressor.
5.6 Solve simple problems on single acting reciprocating air compressors.
5.7 State the advantages of multi- stage compressors over single stage compressor.
5.8 Explain the use of inter cooler.
5.9 State the conditions for minimum work done in two stage compression.
5.10 Write the formula for work done and power required in two stage compressor.
5.11 Solve simple problems in two stage air compressor.
5.12 Name the types of rotary compressors.
5.13 Explain with line diagram the working of a centrifugal compressor.
5.14 Explain with line diagram the working of an axial flow type compressor.
5.15 Explain with line sketch the working of a vane type compressor.

6.0 Understand the working and applications of gas turbines & Jet Propulsion.

6.1 Give broad classification of gas turbines.
6.2 Compare Gas turbines with Steam turbines.
6.3 Compare gas turbines with reciprocating I.C. engines.
6.4 Mention the applications with limitations of gas turbine.
6.5 Explain with line diagrams the working of an open cycle constant pressure type gas turbine.
6.6 Explain with line diagram the working of a closed cycle type gas turbine.
6.7 Represent cycle of operation for the above type on P-V and T-s diagrams.
6.8 Explain with line diagram the principles of operation of Ramjet engine and turbo- jet engines.
6.9 State the application of jet engine.
6.10 Explain with line sketches the working of rocket engine.
6.11 Identify the fuels used in jet propulsion.

COURSE CONTENT

1.0 Air standard cycles.

1.1 Meaning of air standard cycle-its use-Reversible and irreversible process – reversible and irreversible cycles conditions for reversibility of a cycle.
1.2 Brief description of Carnot cycle with P.V. and T-S diagrams, Assumption made – Efficiency - Problems on Carnot cycle.
1.3 Brief explanation of Otto cycle with P.V. and T-S diagrams, assumptions made – Efficiency - Simple problems on Otto cycle.
1.4 Brief description of Diesel cycle with P.V. and T-S diagrams, Assumption made – Efficiency - Simple problems on Diesel cycle.
1.5 Reasons for the highest efficiency of Carnot cycle over other cycles working between same temperature limits.

2.0 The construction and working principle of Internal Combustion Engines.

2.1 Heat engines – Internal combustion engines and external combustion engines advantages of I.C. engines over external combustion engines classification of I.C. engines, neat sketch of I.C. engine indicating component parts, state the function of each part and materials used for the component parts – Cylinder, crank case, crank pin, crank, crank shaft, connecting rod, wrist pin, piston, cooling pins cylinder heads, exhaust valve, inlet valve.
2.2 Brief explanation on the principle of working of four-stroke diesel engine and two-stroke diesel engine.

2.3 Brief explanation on the principle of working of four stroke and two stroke petrol engines.

2.4 Comparison of two stroke engines and four stroke engines. Comparison of diesel engine and petrol engine.

2.5 Draw the valve time diagrams for two stroke and four stroke engines.

3.0 The systems of Internal Combustion Engines.

3.1 Descriptive treatment, with sketches of a diesel fuel system, fuel tanks, fuel filter, fuel pump and fuel injector.

3.2 Descriptive treatment of petrol engine fuel system functions of tank, fuel filter, fuel pump and carburettor, principles of working of a Zenith Carburettor (Line sketch) and its advantages over simple carburettor.

3.3 Cooling system I.C. engines, air cooling, water cooling system with thermo siphon method of circulation and water cooling system with radiator and forced circulation (description with line diagram). Comparison of air cooling and water cooling system.

3.4 Ignition systems – Battery coil ignition and magneto ignition (description and working). Comparison of two systems.

3.5 Types of lubricating systems used in I.C. engines descriptive treatment only with line diagram.

3.6 Types of governing of I.C. engines – hit and miss method, quantitative method, qualitative method and combination methods of governing their applications. Objective of super charging.

4.0 The Performance of Internal Combustion Engines.

4.1 Formulae for B.P.,F.P., I.P., mechanical efficiency, indicated thermal efficiency, air standard efficiency, relative efficiency, Morse test,Heat balance sheet, simple problems on performance of I.C. engines.

5.0 Air Compressors.

5.1 Functions of air compressor – uses of compressed air – types of air compressors.

5.2 Single stage reciprocating air compressor its construction and working (with line diagram) using P.V. diagram Formulae for work done and power required- simple problems on calculation of work done and power required.

5.3 Multi stage compressors – advantages over single stage compressors. Use of air cooler – conditions for minimum work in two stage compressor (without proof) Formulae for work done and power required in two stage compressors – simple problems.

5.4 Rotary compressors – types – descriptive treatment of Centrifugal compressor, axial – f low type compressor and vane-type compressors.

6.0 Gas Turbines & Jet Propulsion

6.1 Gas turbines – Classification – open cycle gas turbines and closed cycle gas turbines – comparison of gas turbine with reciprocating I.C. engines and steam turbines. Applications and limitations of gas turbines.

6.2 Open cycle constant pressure gas turbine – general lay-out. P.V. and T.S diagram and working of gas turbine.

6.3 Closed cycle gas turbine – cycle of P.V. and T.S diagrams – working of gas turbine.

6.4 Principle of operation of Ram – jet engine and turbojet engines – application of jet engines.

6.5 Rocket engine – its principle of working & application.

6.6 Fuels used in jet – propulsion.

REFERENCE BOOKS

1. Thermal Engineering by R.S.Khurmi.
2. Thermal Engineering by Mahesh M Rathore (MGH Publishers)
2. Thermal Engineering by Mathur & Mehtha
3. Fundamentals of I.C.Engines by Heywood
4. Thermal Engineering by P.L.ballaney

FLUID MECHANICS & HYDRAULIC MACHINERY

Subject Title : Fluid Mechanics & Hydraulic Machinery
Subject Code : ME-405
Periods/Week : 05
Periods per Semester : 75

TIME SCHEDULE

S.No	Major Topics	Number of Periods	Weightage of Marks	Short answer Questions	Essay Type Questions
1	Fluid Properties &Hydrostatics	10	16	02	01
2	Flow of Liquids	10	16	02	01
3	Flow through pipes	10	16	02	01
4	Impact of jets	15	18	01	1 ½
5	Hydraulic Turbines	15	21	02	1 ½
6	Hydraulic Pumps	15	23	01	02
	Total	75	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to

Understand the importance of Fluid mechanics, its application in the present day industry and will be in a position to understand the working of Hydraulic Machines.

PART – A – Fluid Mechanics

1.0 Understand the Fluid properties and Hydrostatics

1.1 Define the fluid
1.2 Classify the fluids
1.3 Distinguish between compressible (gases) and incompressible (liquids) fluids
1.4 Distinguish between ideal and real fluids
1.5 State the various units used in fluid mechanics
1.6 Define various properties of fluids and state their units
1.7 Define intensity of pressure
1.8 State units for pressure
1.9 State the Pascal's law
1.10 Differentiate between gauge, absolute and vacuum pressure
1.11 Derive the expression for hydrostatic pressure gradient
1.12 Explain the concept of buoyancy
1.13 Explain the working principle of various instruments used for determining the pressure of fluids
1.14 Solve the problems on pressure measurement by different manometers

2.0 Understand the behaviour of liquids in motion

2.1 Classify the fluid flows
2.2 Distinguish between laminar flow and turbulent flow
2.3 Explain the concept on Reynolds number.
2.4 Explain three laws of conservation
2.5 Explain the various types of energies and the total energy.
2.6 Explain the velocity of a flowing liquid
2.7 Write the discharge equation and equation of continuity of flow.
2.8 State Bernoulli's equation and its application in hydraulics
2.9 Explain the working principle of venturimeter, pitot tube, water and current meters
2.10 Define Co-efficient of Velocity (Cv), Co-efficient of Contraction (Cc), Co-efficient of discharge (Cd).
2.11 Solve problems (simple) on law of continuity, Bernoulli's equation, Venturimeter and Pitot tube.

3.0 Comprehend flow of liquids through pipes

3.1 List various losses when liquid flows through pipes
3.2 State laws of fluid friction
3.3 Write the equations for loss of head due to friction in pipes - Darcy's and chezy's formulae
3.4 List various minor losses in pipe flow
3.5 Explain the hydraulic gradient and total energy lines for different pipes
3.6 Explain the pipes in series(compound pipe) and equivalent pipe
3.7 Calculate the velocity of flow, discharge and diameter of pipes connecting two reservoirs
3.8 Explain the function of siphon and give reason for limiting the height of the pipes
3.9 Explain how the power can be transmitted through pipes carrying liquid under pressure
3.10 Write the condition for maximum power through pipes
3.11 Solve simple problems on power transmission through pipes

4.0 Analyse forces due to the impact of jets

4.1 Derive expression for force of jet on fixed vertical, flat plate, fixed inclined flat plate, and moving flat plate
4.2 Derive expression for the force of jet on a series of plates fixed on the rim of a wheel
4.3 Draw velocity triangles for fixed and moving curved blades
4.4 Derive the expressions for work done, power and efficiency in the above
4.5 Solve simple problems related to the above

B. Hydraulic machines

5.0 Understand the working of hydraulic (water) Turbines

5.1 State the importance of water turbines
5.2 Draw the layout of a hydroelectric power station
5.3 Classify the water turbines on different criteria
5.4 Explain the construction details and working of Pelton wheel
5.5 Explain the construction details and working of Francis turbine
5.6 Explain the construction details and working of Kaplan turbine
5.7 Explain the draft tube theory
5.8 Explain the governing of water turbines with a legible sketch
5.9 Write the formulae for work done and efficiency of pelton wheel turbine
5.10 Write the formulae for work done and efficiency of francis turbine
5.11 Solve simple problems on water turbines

6.0 Understand the working of hydraulic pumps

6.1 Explain the function of hydraulic pump
6.2 Classify the hydraulic pumps
6.3 Explain the principle of operation of reciprocating pumps
6.4 Describe the constructional details of single acting pump with the legible sketch
6.5 Describe the constructional details of double acting pump with the legible sketch
6.6 Explain the slip in the reciprocating pump
6.7 State the effect of velocity and acceleration of fluids in suction and delivery pipes
6.8 Explain the principle of air vessel with respect to reciprocating pump
6.9 Solve simple problems on power required to drive reciprocating pump
6.10 Explain the principle of operation of centrifugal pumps with a legible sketch
6.11 Explain the constructional details of centrifugal pump
6.12 Compare the centrifugal pump with a reciprocating pump
6.13 Explain the working of multi-stage pumps with a legible sketch
6.14 Appreciate the importance of priming in centrifugal pump
6.15 Identify the effects of leakages of air, its prevention
6.16 Explain the phenomenon of cavitation and state its effect
6.17 Write the expressions for static and manometric head of centrifugal pump
6.18 Write the formula for work done by the impeller of centrifugal pump
6.19 Explain the various losses and efficiencies of a centrifugal pump
6.20 Solve simple problems on centrifugal pumps
6.21 Draw the layout of a centrifugal pump installation
6.22 Explain the working of Jet pump with a legible sketch
6.23 Explain the working of submersible pump with a legible sketch

COURSE CONTENT

PART – A – Fluid Mechanics

1.0 Properties of fluids

1.1 Definition of fluid, Ideal and Real fluids, Newtonian and Non-Newtonian fluids, compressible and incompressible fluids
1.2 Units used in Fluid Mechanics.
1.3 Fluid properties-Density, specific weight, specific gravity, viscosity and surface tension, compressibility and capillarity.
1.4 Intensity of pressure, Pascal's law, Atmospheric,Vacuum,Gauge and absolute pressures.
1.5 Measurement of pressures by piezo-meter, , U-Tube - manometer, differential manometer bourdon pressure gauge
1.6 The concept of buoyancy
1.7 Simple problems on pressure measurement

2.0 Flow of Liquids

2.1 Types of fluid flow- Steady and unsteady flow, Uniform and Non-uniform flow, Two &Three dimensional flow, Rotational & irrotational flow, Laminar & Turbulent flow
2.2 The concept of Reynold's Number.
2.3 Pressure, potential and kinetic energy of liquids, total energy
2.4 Continuity equation for one-dimensional flow
2.5 Solving of simple problems
2.6 Laws of conservation- Mass, Energy and Momentum
2.7 Velocity of liquids and discharge
2.8 Bernoulli's equation and assumptions its practical applications

2.9 Applications of Bernoulli's equation - Venturimeters, pitot-tube, current meters
2.10 Problems on Bernoulli's Equation, Venturimeter and pitot tube.
2.11 Definition of Cv,Cc, and Cd

3.0 Flow through pipes

3.1 Various losses when liquid flows through pipes, Laws of fluid friction
3.2 The equations for loss of head in pipes due to friction- Darcy's & Chezy's formula (without proof)
3.3 Minor losses in pipe flow
3.4 Hydraulic gradient and total energy line for different pipes
3.5 Pipes in series(Compound pipe) and equivalent pipe
3.6 Calculation of discharge, velocity, diameter of pipe etc., for pipes connecting two reservoirs (considering frictional losses only)
3.7 The function of Siphon, study of pressure head variations at its different sections, minimum pressure at apex and its influence in causing separation (Numerical problems omitted)
3.8 Expressions for power transmitted through pipes carrying liquid under pressure
3.9 Expressions of transmission efficeny, condition for maximum efficiency (without proof.)
3.10 Simple problems on power transmission through pipes

4.0 Impact of jets

4.1 Derivation of formulae for the force of jet on
a) Fixed vertical flat plate
b) Fixed inclined flat plate
c) Moving flat plates – vertical and inclined
d) Series of flat plates fixed on the rim of a wheel

4.2 Force of jet striking at the centre and at the top of a fixed curved blade and moving curved blade, velocity triangles
4.3 Work done, power and efficiency in the above cases. Simple problems only

PART – B – Hydraulic Machines

5.0 Water turbines

5.1 Introduction to hydraulic machines- water turbines, pumps
5.2 Use of water turbines in Hydra-electric power stations; line sketch showing layout of hydro-electric power plant with head race, dam, sluice gate, pen stock, turbine, generator and tail race.
5.3 Classification of turbines-impulse and reaction turbines brief sub-classification as axial, radial and tangential flow type
5.4 Working principle of Pelton wheel, Francis turbine and Kaplan turbine with simple line sketches only.
5.5 Draft tube and Governing of Water turbines
5.6 Work done and Efficiencies of Pelton wheel and Francis turbine(Without derivation)
5.7 Simple Problems on power & efficiency of water turbines

6.0 Pumps

6.1 Function of a pump

6.2 Classification of pumps
6.3 Principle of operation of a reciprocating pump
6.4 Constructional details of single acting, double acting pumps.
6.5 Effect of velocity and acceleration of fluids, in suction and delivery pipes (without proof)
6.6 Expression for theoretical power required to drive the pump (without proof). Simple problems related to above
6.7 Coefficient of discharge, slip, % of slip and negative slip
6.8 Air vessel
6.9 Working principle & Constructional details of centrifugal pump
6.10 Installation of centrifugal pump, showing its mountings and other accessories
6.11 Comparison between Reciprocating and Centrifugal pumps
6.12 Priming of centrifugal pump and its necessary leakages of air its prevention
6.13 Work done by the impeller, Static head, Manometric head
6.14 Efficiencies- Manometric efficiency, Volumetric efficiency, Mechanical efficiency and Overall efficiency
6.15 Cavitation and its effect.
6.16 Simple problems on work, power and efficiency
6.17 Working principle of Jet & Submersible pumps with line diagrams.

REFERENCE BOOKS

1. Fluid Mechanics and Hydraulic Machines by Sukumar Pati, Tata McGraw Hill publication.
2. Hydraulic Machines By S.Anantha Swamy
3. Hydraulic Machines By R.C. Patel
4. Hydraulics By Malhotra & Malhotra
6. Hydraulics & Hydraulic Machinery By Yeaple
8. Hydraulics and Pneumatics By Reya and Rao.

PRODUCTION TECHNOLOGY - I

Subject Title : Production Technology-I
Subject Code : ME – 406
Periods Per Week : 04
Periods Per Semester : 60

TIME SCHEDULE

S.No	Major Topics	Number of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Milling	20	39	03	03
2	Gear Making	10	16	02	01
3	Grinding and finishing processes	16	34	03	02½
4	Metrology	14	21	02	01½
	Total	60	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to understand

1.0 Understand the concept of Milling

1.1 Explain the principle of working of a Milling machine.
1.2 Classify the milling machines.
1.3 Illustrate the constructional details of milling machine
1.4 Explain the functions of each part of the milling machine.
1.5 Explain the various milling operations.
1.6 List the different milling cutters.
1.7 Explain selection of tool and work holding devices.
1.8 Explain the different indexing methods.
1.9 Explain the specifications of milling machines.

2.0 Understand the concept of Gear Making

2.1 List the different methods of producing gears.
2.2 Illustrate gear shaping.
2.3 Draw the gear hob and label its components
2.5 Describe the working of the above m/c.
2.6 List the sequence of operations in generating gear by gear hobbing m/c.
2.7 Explain the different methods of finishing & checking gear teeth dimensions.
2.8 Specify the gear.
2.9 List the various gear materials.
2.10 State the different heat treatment processes applied to gears.

3.0 Understand the concept of Grinding and finishing Processes

3.1 Explain the principle of metal removal by grinding.
3.2 List the different abrasives.
3.3 Explain the bonds and binding processes in grinding wheel manufacturing
3.4 Identify the grinding wheel from the standard code (Marking system or designation of wheel).
3.5 State the factors for selecting the grinding wheels.
3.6 State the methods of grinding.
3.7 Classify the grinding machines.
3.8 Illustrate the cylindrical, surface, tool and cutter grinders.
3.9 List the different work holding devices.
3.10 State the methods of wheel maintenance.
3.11 State different finishing processes by grinding.(Honing, Lapping, Super finishing)
3.12 Explain the principle of electro–plating with a legible sketch.
3.13 Explain the principle of hot dipping processes namely galvanising, tin coating, Parkerizing and anodising.
3.14 List the various organic coatings.
3.15 Describe the processes of various organic coatings
3.16 State the principles of metal spraying.
3.17 State the features of wire process and powder process.
3.18 Select the appropriate process for surface roughness of a given application

4.0 Understand the concept of Metrology

4.1 Identify various linear and angular measuring instruments.
4.2 Explain the principle of working of (at least 4 types) comparators with a legible sketch.
4.3 Predict the amount of measuring accuracy using the comparator.
4.4 Identify the in-accuracies in surface finish.
4.5 Suggest the surface finish measuring instrument.
4.6 State the use of collimator and microscope.
4.7 State the principle of working of interferometer.

COURSE CONTENT

1.0 Milling

1.1 Introduction.
1.2 Types of milling machines: plain, Universal, vertical, constructional details – specifications.
1.3 Milling operations
1.4 Indexing: simple, compound and differential indexing.
1.5 Milling cutters – types – nomenclature of teeth – teeth materials
1.6 Tool signature of milling cutter.
1.7 Tool & work holding devices.

2.0 Gear Making

2.1 Manufacture of gears – by casting, moulding – stamping - coining extruding- rolling – Machining.
2.2 Gear generating methods: Gear Shaping with pinion cutter & rack cutter
2.3 Gear hobbing – Description of gear hob – Operation of gear hobbing machine.
2.4 Gear finishing processes.

2.5 Gear materials and specification.
2.6 Heat treatment processes applied to gears.

3.0 Grinding and finishing processes

3.1 Introduction – principles of Metal Removal by Grinding.
3.2 Abrasives – Natural & Artificial.
3.3 Bonds and binding processes: Vitrified, silicate, shellac, rubber, bakellite.
3.4 Factors effecting the selection of grind wheels – size and shape of wheel – kind of abrasive – grain size – grade and strength of bond – structure of grain – spacing – kinds of bind material.
3.5 Standard marking systems: Meaning of letters & numbers sequence of marking – Grades of letters.
3.6 Grinding machines – classification: Cylindrical, Surface, Tool & Cutter grinding machine- construction details – relative merits.
3.7 Principle of centreless grinding
3.8 Advantages & limitations of centreless grinding
3.9 Work- holding devices.
3.10 Wheel maintenance – Balancing of wheels – Dressing and trimming of grind wheels: Coolants used.
3.11 Finishing by grinding: Honing, Lapping, Super finishing
3.12 Electroplating – Basic principles – Plating metals – applications.
3.13 Hot dipping: Galvanizing, Tin coating, parkerising, Anodizing.
3.14 Metal spraying: wire process, powder process and applications.
3.15 Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating.
3.16 Finishing specifications.

4.0 Metrology.

4.1 Linear measurement: Slip gauges and dial indicators.
4.2 Angle measurements: Bevel protractor, Sine Bar, Angle Slip Gauges.
4.3 Comparators :a) Mechanical b) Electrical c) Optical d) pneumatic
4.4 Measurement of surface roughness: methods of measurements by comparison, tracer instruments and by interferometry.
4.5 Collimators.
4.6 Measuring Microscope. Interferometer.

REFERENCE BOOKS

1. Manufacturing Technology - P N Rao (MGH Publishers)
2. Production Technology - R.C.Patel
3. Production Technology - Jain & Gupta.
4. Gear Technology - Charrathi
5. A Text Book of Production Engg. - Dora
6. Tool Design - Donaldson

PRODUCTION DRAWING PRACTICE

Subject Title : Production Drawing Practice
Subject Code : ME-407
Period/Week : 07
Period per Semester : 105

TIME SCHEDULE

S.No	Major Topics	Number of Periods	Weightage of Marks	Short Answer Questions	Esaay Type Questions
1	Drawing of a Component	12	05	01	-
2	Limits, Fits & Tolerances	14	05	01	-
3	Surface finish	14	-	-	-
4	Specification of materials	14	05	01	-
5	Process sheet & Exercises in Production Drawing	45	80	-	02*
6	Reprographic process	06	05	01	-
	Total	105	100	04	02

***NOTE :**
1. Candidate has to answer all questions in part- A and one question from Part- B out of two.
2. Part B question carries 40 marks and distributed for views, process Sheet, selection of materials, surface finish, limits, fits and tolerances

OBJECTIVES

Up on the completion of the course the student shall be able to

1.0 Understand the need of production drawing.
- 1.1 Distinguish the machine drawing from a production drawing.
- 1.2 State the factors that govern the preparation of a production drawing.
- 1.3 Identify the components of a production drawing.
- 1.4 List the function of the component.
- 1.5 Prepare the relevant views of the part and dimension the part.
- 1.6 Indicate the details of specific processes like, heat treatment, welding, counter boring etc.

2.0 Interpret dimension to obtain a fit as per BIS standards.
- 2.1 State definition of fit, allowance and tolerance.
- 2.2 Select dimension from standards to give different type of fit for a given mating parts.
- 2.3 Compute the fit from tables.
- 2.4 Indicate fits on the drawings.

3.0 Identify the standard symbol and indication added to it, to represent surface finish.

3.1 Indicate the roughness grade number and corresponding symbol as per BIS.

3.2 Indicate surface roughness on drawings.

4.0 Interpret and estimate the material requirement.

4.1 Identify the material of various components.

4.2 Specify the raw material as per commercial/BIS Standards.

4.3 Identify the standard part that can be procured directly from the market and specify the part as per commercial/BIS Standards for procurement.

5.0 Write the process sheet of production and prepare the number of production drawings.

5.1 Indicate the sequence of process of production.

5.2 Specify the relevant tools to obtain the accuracy and finish.

5.3 Indicate the suitable equipment.

5.4 Specify the type of measuring instruments to be used to check the prescribed accuracy.

5.5 Prepare exercises on production drawing as mentioned in the contents.

6.0 Practice the method of preparing blue print and ammonia prints.

6.1 Understand the preparation of blue and ammonia prints from tracing.

6.2 List the advantages and disadvantages of the above prints.

6.3 Identify the other methods of reproducing drawing.

Key Competencies to be achieved by the student

Topic	Key competency
Drawing of a Component	• Understand the difference between machine drawing and production drawing. • Identify the components in Assembly Drawing • Appraise the importance of symbols.
Limits, Fits & Tolerances	• Use of fits, allowances and tolerances. • Identify tolerance grades and zones. • Distinguish types of fits, limits • Select suitable fit for mating parts
Surface finish	• Identify the surface texture , symbols and grading as per BIS • Indicate surface roughness symbols on drawings
Specification of materials	• Identify of different material of the each component drawing.
Process sheet & Exercises in Production Drawing	• Interpret the production processes and the sequences. • Specify the relevant tools to obtain required accuracy and finish • Indicate equipment and measuring instruments to produce and check the accuracy of the component.

Reprographic process	• Operate the Xerox machine, Ammonia printing machine and microfilming machine

COURSE CONTENT

1.0 Introduction and Drawing of component.

Need of preparing a production drawing, requirements for manufacturing a product like equipment, tools, measuring instruments depending upon processes, accuracy and finish data available in machine drawing – components of a production drawing, fits and tolerances, surface finish, specific processes, material of the component.

Read a given assembly drawing – study of the functions of the various parts of the assembly drawing.

Preparation of detailed drawing of a specified part of the assembly.

2.0 Limits, fits and tolerances.

Definitions of limits, fits and tolerances.

Select dimensions from BIS standards to obtain clearance, transition and interference fits for a given set to mating parts – computation of fit and tolerance from BIS table.

Preparation of drawing of mating parts and representation of fits and tolerances.

Exercises in computing tolerance and representation on the drawings for different types of fits.

3.0 Surface finish.

Standard symbol of surface finish and indications added to it.

Representation of quality of surface finish on the drawing as BIS roughness grade numbers.

4.0 Specifications of materials.

Materials of the parts of the assembly – size of part, estimation of raw material required for a component and specification.

Standard components (parts) like bolts, nuts, bearings etc. – specification of standard parts.

5.0 Process sheets and Production drawing exercises.

Sequence of processes of production for a particular product.

Specifications of relevant equipment and tools to obtain the desired accuracy and surface finish. Selection of measuring instruments to check the accuracy.

Prepare the relevant views of the part(s) of a given assembly drawing needed for the purpose of production.

Dimension the views obtained in 7.1, and indicate on it with relevant notes the specific processes. Compute the fit from ISI tables as per the function of the component and indicate the limits at appropriate place on the drawing prepared.

Mark the surface finish symbols with indications added.

Prepare the process sheet indicating sequence of processes and equipment, tools, measuring instruments required.

6.0 Reprographic processes.

Brief description, sequence of operations to prepare Ammonia prints, Advantages and limitations.

Other reproduction processes of drawings like Xerox, Microfilming etc.

NOTE: **In order to develop the abilities required in the preparation of production drawing in the student, the use of actual production drawing from the local industries as exercises to the students is of vital importance.**

Exercises

Flange Coupling, Universal Coupling, Eccentric, Clapper Block, Connecting rod
Drill jig, Lathe tail stock, Revolving Centre, Knuckle Joint, Plummer Block
Lathe Tool post, Non Return valve, Foot Step bearing, and Stuffing box

REFERENCE BOOKS

1. IS 696 – 1972-Code of Practice for General Engg. Drawing & B.I.S Code – SP . 46.
   IS 696 – 1988- IS Code on fits and tolerances.
2. Blur print reading for Mechanical Trades by B.R.Sachdeva.
3. Machine drawing by R.B. Gupta.
4. Machine Drawing by Siddeswar.
5. Production Drawing by K.Venkat Reddy
6. Machine Drawing by Nagpal

COMMUNICATION SKILLS LAB PRACTICE
(Common to all branches)

Subject title : Communication skills practice
Subject code : ME - 408
Periods per week : 03
Periods per semester : 45

Time Schedule

Sno.	Topic	Periods	Weightage of marks (End Exam)	Sessional marks	Total
1	Listening I	3	10	10	20
2	Listening II	3			
3	Introducing oneself	3	50	30	80
4	Describing objects	3			
5	Describing events	3			
6	Reporting past incidents	3			
7	Speaking from observation / reading	3			
8	JAM	6			
9	Group discussion	6			
10	Mock interviews	6			
11	Making presentations	6			
		45	60	40	100

Rationale and Scope

In the context of globalization , competence in speaking skills is the need of the hour The gap between the needs of the industry and the curriculum can be bridged by enabling the students to hone their speaking and listening skills. This course aims at providing opportunities for practicing speaking.

PBJECTIVES

Upon completion of the course the students shall be able to

- Strengthen their listening skills
- Strengthen their speaking skills

Competencies and key competencies to be achieved by the student

Topic	Teacher's input/ methodology	Students competence
Listening I Listening II	Pre- Listening –eliciting, pictures While - Listening Post –Listening –project , writing	Identifying the main idea, Identifying specific details, Identifying parallel and contradictory ideas Drawing inferences, Reasoning
Introducing oneself	Kinds of introduction --official/ personal, dynamic vocabulary, Body language, Model introduction, Use of line ups	Use of simple present tense, Sequencing, Appropriate vocabulary
Reporting incidents	Group work /pair work, Elicit, Use of past tense, Student presentations	Use of past tense, Relevant vocabulary
Describing objects	Vocabulary , Use of adjectives, Games—I spy, Group presentations	Use of adjectives, Dimensions,shapes Compare and contrast, sequence
Describing events	Group work/pair work Use of appropriate tense	Use of appropriate tense, sequencing
Reporting past incidents	Use of past tense, Vocabulary Student presentations	Use of past tense , sequencing
Speaking from observation/reading	Group work/pair work, Reading techniques ,	Use of past tense, Summarising , evaluating, comprehension
JAM	Effective techniques , Good beginning , conclusion, tips, Use of line ups	Vocabulary, Sequencing, Fluency, Thinking spontaneously
Group discussion	Expressing opinion, body language,	Expressing opinion, agree/ disagree, fluency,Persuasive and leadership skills
Mock interview	FAQs , body language	Role play, body language,
Making presentations	Student presentations	Using charts , pictures, interpreting data, sequencing,PPTs

Communicative methodology (CLT) should be used to create an interactive class. Apart from the suggestions given teachers are free to innovate to use any activity to improve the language competence of students . Attention can also be given to improve the accent and intonation of students.

Note:
* This subject is a theory subject.
** The workload should be calculated as theory workload.
***Examinations in the subject will be treated as a practical one.

MATERIAL TESTING LABORATORY PRACTICE

Subject Title : Material Testing Lab Practice
Subject Code : ME-409
Periods/Week : 03
Periods/Semester : 45

TIME SCHEDULE

S.NO	EXPERIMENT TITLE	NO.OF PERIODS
1	Tensile test	06
2	Compression test	06
3	Impact test	06
4	Hardness test	09
5	Torsion test on springs	09
6	Study of micro structure of Metals and alloys	09
	TOTAL	45

OBJECTIVES
Up on the completion of the course the student shall be able to:

1.0 Understand the various material testing methods.

1.1 Define the various properties of materials such as: yield stress, Ultimate stress, percentage elongation, Young's Modulus.
1.2 Conduct experiments on concrete cube, cast iron, timber to test for its compressive strength.
1.3 Practice the method of determining the Young's modulus of materials by the principle of deflection.
1.4 Determine the modulus of rigidity by the method of deflection of helical springs.
1.5 Appreciate the importance of various mechanical properties such as hardness, impact strength.
1.6 Perform tests to determine the above.

1.7 Practice the method of preparing a specimen for the metallography.
1.8 Interpret the microstructure of specified ferrous and non ferrous materials.
1.9 Handle the metallurgical microscope to study the microstructures.

Key competencies to be achieved by the student

Exercise	Key competencies expected	Max. Marks	Marks awarded
1. Tensile test	A. Fix specimen in the jaws of the machine B. Fit strain gauge to the specimen C. Apply load gradually on the specimen D. Record load, elongation, diameter without error E. Plot graph stress vs strain F. Locate points of elastic limit, yield stress, ultimate stress on the graph	A. 1 B. 2 C. 1 D. 2 E. 2 F. 2 Total: 10	

Exercise	Key competencies expected	Max. Marks	Marks awarded
2. Compression test	A. Place the specimen in the machine properly B. Apply load on the specimen C. Record load	A. 2 B. 1 C. 2 Total : 5	
3. Impact test	A. Prepare specimen by making V notch at the required height B. Fix specimen on the machine C. Release load to hit the specimen precautious D. Record load	A. 2 B. 1 C. 1 D. 1 Total 5	
4. Hardness test	A. Place the specimen on the machine at correct location B. Identify suitable indenter for the specimen C. Make indent on the specimen properly D. Measure diameter of indentation E. Calculate hardness number	A. 1 B. 1 C. 2 D. 3 E. 3 Total 10	
5. Torsion test of springs	A. Measure spring diameter and spring wire diameter with vernier callipers B. Measure deflection applying load C. Calculate modulus of rigidity of spring material	A. 4 B. 2 C. 4 Total 10	
6. Study of micro structure of Metals	A. Prepare specimen B. Handling microscope to	A. 5 B. 2	

and alloys	observe micro structure C. Plot microstructure	C. 3 Total 10	

COURSE CONTENT

1. Determination of yield stress, ultimate stress, percentage reduction in area, percentage elongation, Young's modulus by conducting tension test on Universal testing machine.
2. Determination of crushing strength of concrete cube, cast iron, glass, tiles, timber etc., using UTM/CTM
3. Determination of Young's Modulus by the method of deflection.
4. Determination of Modulus of rigidity of spring steel by the deflection of springs.
5. Determination of impact strength of the material using Izod and Charpy's tests.
6. Determination of hardness of meterial using Brinnel and Rockwell Testing methods.
7. Specimen preparation for the metallography.
8. Study of microstructures of Mild steel, pure iron, Grey cast iron, S.G. Iron, Eutectoid steel, Stainless steel, Aluminum, Brass, Bronze.

MANUFACTURING&FABRICATION ENGINEERING LAB-II PRACTICE

Subject Title : Manufacturing/Fabrication Engg. Lab Practice II
Subject Code : ME-410
Periods/Week : 03
Periods per Semester : 45

TIME SCHEDULE

S.NO	EXPERIMENT TITLE	NO.OF PERIODS
1	Hands on practice on Lathe	18
2	Hands on practice in welding	12
3	Hands on practice in foundry processes	15
	TOTAL	45

OBJECTIVES

Up on the completion of the course the student shall able to

1.0 Practice the operations on the Lathe.

1.1 Calculate the gear ratio for thread cutting.
1.2 Cut threads on a lathe machine.
1.3 Produce articles of industrial application such as snap gauges, plug gauges, handle etc.
1.4 Perform the combination of operations to produce jobs.
1.5 Perform special turning operations to produce machine handle, eccentric turning, male and female fit assembly

2.0 Practice the joining operations in Welding.

. 2.1 Weld the material to produce. T, H, and angular joints.

3.0 Practice the Foundry processes

3.1 Prepare a mould for connecting rod, pulleys.
3.2 Prepare Core for hollow jobs.

COURSE CONTENT

A. Machine Shop (Turning)

1. Thread cutting 2. Handle 3. Combination of all the operations.
4. Eccentric turning. 5. Male and female fit assembly

B. Welding

1. T. Joint, 2. H – Joints, 3.Angular joints.
4. 2-joints (H Joints and T Joints)

3. Foundry

1.Connecting rod, 2.core making 3.pulleys.

Key competencies Expected from the student

S.No	Exercise	Key competency
Machine shop (Turning Shop)		
1	Thread cutting	a. Center the job with dial gauge b. Fix the cutting tool in suitable angle c. Turn the component with suitable speed and feed d. Cut the threads with back gear arrangements
2	Production of handle	a. Align job with the axis of lathe b. Cut the threads with back gear arrangements
3	Combination of all operations	a. Perform Centering of job b. Feeding the tool c. Fix the cutting tool in appropriate position d. Cut the metal with suitable speed and feed
4	Eccentric turning	a. Fix the job in a chuck with correct eccentricity b. Fix the cutting tool in correct position c. Cut the metal with suitable speed and feed
5	Male and female fit assembly	a. Center the job with dial gauge b. Fix the cutting tool in suitable angle c. Turn the component with suitable speed and feed d. Locate the center of hole e. Select suitable drill bit f. Drill the hole with suitable speed and feed g. Enlarge the hole to suitable diameter by using boring tool
Welding		

6	T-Joints, H- Joints, Angular Joints	a. Perform edge preparation b. Hold the electrode at suitable angle c. Identify the suitable Method of welding technique. d. Maintain proper distance between work piece and electrode tip produce arc e. Check the weld bead
Foundry		
7	Connecting rod	a. Select the suitable sand and its mix for the mould b. Place the pattern in correct position c. Ram the sand properly d. Provide vent holes e. Remove the pattern slowly f. Cut gates and runners g. Pour sufficient quantity of molten metal into the mould cavity
8	Core making	a. Prepare suitable core sand mix b. Select wooden mould box c. Pour the core sand into the mould box and proper ramming of the sand d. Prepare baking of the core

S.No	Exercise	Key competency
9	Pulleys	a. Select the suitable sand and its mix for the mould b. Place the pattern in correct position c. Prepare the core d. Place the core in correct position e. Ram the sand properly f. Provide vent holes g. Remove the pattern slowly h. Cut gates and runners i. Pour sufficient quantity of molten metal into the mould cavity

REFERENCE BOOKS

7. Exercises on Work shop practice- Course material prepared By TTTI, ECH

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
ME-501	Industrial Management	4	-	60	3			100
ME-502	Design of Machine Elements -II	4	-	60	3			100
ME-503	Estimating & Costing	4	-	60	3			100
ME-504	Heat Power Engineering-II	4	-	60	3			100
ME-505	Fluid Power System	4	-	60	3			100
ME-506	Machine Tool Engineering	4	-	60	3			100
PRACTICAL:								
ME-507	CAD Lab Practice	-	6	90	3			100
ME-508	Life skills	-	3	45	3			100
ME-509	Hydraulics & Pneumatics Lab Practice	-	3	45	3			100
ME-510	Field practices	-	6	90	3			100
	TOTAL	24	18	630				1000

INDUSTRIAL MANAGEMENT

Subject Title : Industrial Management
Subject Code : ME –501
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage Of Marks	Short Answer Questions	Essay Type Questions
1.	Principles and functions of Management	10	21	02	1½
2.	Organisation structure & organisational behaviour	20	34	03	2 ½
3	Production Management	14	26	02	02
4.	Materials Management	16	29	03	02
	Total	60	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the principles of management as applied to industry

1.1 Define industry, commerce (Trade) and business.
1.2 Explain the scope and need for management.
1.3 Understand the evolution of management
1.4 Explain the principles of scientific management.
1.5 Understand functions of Management.
1.6 Differentiate between management and administration.

2.0 Understand types of ownerships, the organisation structure of an industry and the behaviour of an individual in an organisation

2.1 Explain types of ownerships
2.2 Differentiate types of ownerships.
2.3 Explain salient features of joint stock companies.
2.4 Need of organisation structure of an industry.
2.5 Explain the line, staff and Functional organisations along with legible sketches.
2.6 List the advantages and limitations of line, staff and functional organisations.
2.7 List different departments in a large scale industry.
2.8 Explain the factors of effective organisation.
2.9 Explain organisational behaviour.
2.10 Explain job analysis.
2.11 Assess the incurring applicants.
2.12 Outline the selection process.
2.13 List the sources of manpower.

2.14 State motivation theories.
2.15 State Maslow's Hierarchy of needs.
2.16 Explain the phenomena of satisfaction.
2.17 Explain the performance levels.
2.18 Explain reward system
2.19 List different leadership models.
2.20 Explain the trait theory of leadership.
2.21 Explain behavioural theory of Leadership.
2.22 Explain the process of decision Making.
2.23 Explain the communication process.
2.24 Analyse the behaviour of groups in an organisation.
2.25 Explain group dynamics.
2.26 Detail the process of managing conflict.
2.27 Explain conflict resolution strategies.

3.0 Understand the different aspects of production management

3.1 Differentiate and integrate production, planning and control.
3.2 Relate the production department with other departments.
3.3 State the need for planning and it's advantages.
3.4 Explain the stages of Production, planning and control.
3.5 Explain routing methods.
3.6 Explain scheduling methods.
3.7 Explain dispatching.
3.8 Draw PERT/CPM networks.
3.9 Identify the critical path.

4.0 Understand the role of materials management industries

4.1 Explain the role of the materials in Industry.
4.2 Derive expression for inventory control.
4.3 Explain ABC analysis.
4.4 Define safety stock.
4.5 Define reorder level.
4.6 Write the expression for economic ordering quantity and mention the terms involved in the expression.
4.7 Explain stock layout.
4.8 List stores records.
4.9 Explain the Bin card.
4.10 Describe Cardex method.
4.11 Explain purchasing procedures.
4.12 List purchase records.
4.13 List the stores equipment
4.14 Explain the need of material handling methods.
4.15 Explain material handling methods. List out hoists, cranes, conveyers, trucks, and forklift trucks.
4.16 Explain break-even analysis.

COURSE CONTENT

1. Principles and functions of management

Definitions of Industry, Commerce and Business. Evolution of management theories. Principles of Scientific Management, functions of management. Difference of administration and management.

2. Organisation Structure & organisational behaviour

Role of industry, Types of ownership – Sole proprietorship, Partnership, Private limited, Public limited company, Industrial Cooperatives, Philosophy, types of Organisations, Line and Staff and functional organisations. Advantages and limitations, departments in a large scale industry. Effective organisation. Job analysis, Assessing applicants, selection, motivation, different theories, satisfaction, performance reward systems , Leadership in organisation, decision making, communication, group dynamics, Managing conflict.

3. Production Management.

Production, planning and control, relation with other departments, need for planning and its advantages, Routing, scheduling, despatching, PERT and CPM, simple problems.

4. Materials Management.

Materials in industry, inventory control model, ABC Analysis, Safety stock, re-order, level, Economic ordering quantity, Break even analysis, Stores layout, stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, Hoist, Cranes, conveyors, trucks, fork trucks.

REFERENCE BOOKS

1. Industrial Engineering and Management -by O.P Khanna
2. Production Management- by Buffa.
3. Engineering Economics and Management Science - by Banga & Sharma.
4. Personnel Management by Flippo.

DESIGN OF MACHINE ELEMENTS-II

Subject Title : Design of Machine Elements-II
Subject Code : ME–502
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1.	Belts and chain drives	12	21	02	1 ½
2.	Gear drives	12	21	02	1 ½
3.	Fly wheels and Governors	10	21	02	1 ½
4.	Brakes and Clutches	14	26	02	02
5.	Cams	12	21	02	1 ½
Total		**60**	**110**	**10**	**08**

OBJECTIVES

Up on completion of the course the student shall be able to

1. Understand the Design of Belts and chain drives

1.1 List the different power drives
1.2 Compare the flexible drives with the rigid drives
1.3 Classify the belt drives
1.4 List the belt materials
1.5 Define the slip and creep in belts.
1.6 Explain the effect of slip and creep on power transmission
1.7 Derive the expression for the length of open and cross belts
1.8 Derive the expression for ratio of limiting belt tensions
1.9 Derive the expression for centrifugal tension in the belt
1.10 Explain the effect of centrifugal tension on power transmission
1.11 Design the belt cross-sectional dimensions (V-belts are excluded)
1.12 Design the cone pulley for open and cross belts
1.13 Solve the numerical problems related to the above cases
1.14 List the different elements of chain drive
1.15 Classify the chain drives
1.16 Differentiate between belt and chain drives
(Problems and derivations are excluded for chain drives)

2. Understand the Design of Gear drives

2.1 Explain the nomenclature of spur gear tooth.
2.2 State the law of gearing (Derivation is excluded)
2.3 Identify various tooth profiles of gear.
2.4 Explain the terminology related to gear drive
2.5 List the gear material
2.6 List different types of gear trains
2.7 List all the advantages and disadvantages of gear drives
2.8 Classify the gear drives based on different criteria

2.9 Write the Lewis bending equation
2.10 Design the gear based on Lewis equation
2.11 Design different types of gear trains for given velocity ratios
2.12 Explain the applications of gear trains
2.13 Solve the problems related to simple, compound and reverted gear trains

3. Understand the Design of Fly wheels and Governors

3.1 State the function of flywheel
3.2 List the applications of flywheel
3.3 Explain the terms related to flywheel
3.4 Derive the expression for maximum fluctuation the formula for energy stored by flywheel
3.5 Design the rim type flywheel for the max fluctuation of energy
3.6 Solve simple problems on fly wheel
3.7 Explain the function of governor using legible sketch
3.8 Classify the governors
3.9 Distinguish between Governor and Flywheel
3.8 Describe the working principle of Watt governor and Porter governor using legible sketch
3.9 Write the expressions for the height of watt and Porter governor
3.10 List the applications of governor
3.11 Explain the terms – sensitiveness, stability, isochronism, hunting, effort and power of governor
3.12 Solve simple problems on governors

4. Understand the Design of Brakes and Clutches

4.1 State the function of brake
4.2 Classify the brakes
4.3 List all the brake material
4.4 Explain the working of block brake with the help of legible sketch
4.5 Explain the working of shoe brake with the help of legible sketch
4.6 Explain the working of band brake with the help of legible sketch
4.7 Derive an expression for the braking torque
4.8 Solve simple problems related to brakes
4.9 Explain the Function of clutch
4.10 Classify the clutches
4.11 List all the clutch materials
4.12 Explain the working of single and multiple plate c
4.13 Design single plate and multi-plate clutches based on uniform pressure and uniform wear
4.14 Solve simple problems related to clutches

5. Understand the Design of Cams

5.1 Explain the function of cam
5.2 Explain the features of cam profile.
5.3 Classify the cams.
5.3 Define terms related to cam profile.
5.4 Draw angular - displacement diagram for lift motion for:
a) Uniform velocity.
b) S.H.M.
c) Uniform acceleration & retardation.

5.5 Draw simple cam profiles in above three cases for knife edged, flat and roller followers. (offset followers are omitted)

COURSE CONTENT

1. Belts and chain drives

Factors to be considered while selecting the type of drive -Belt drive, types of belt drives; belt materials, belt joints- length of open and crossed belts (without proof). Design procedure (Phases of design) - Design of stepped pulley belt drive only.- Expression for the ratio of belt tensions (without proof).- Concept of centrifugal tension – Relation between centrifugal tension and the tension on tight side for transmitting maximum power (derivation omitted) - Permissible stress in the belt per unit width : per unit cross section-Calculation of belt thickness and width for given permissible stress for open and crossed belts, considering centrifugal tension and without considering centrifugal tension. – Simple problems-Chain drives – Advantages - Types of chains – Roller and silent chains - (problems on chain drives omitted)

2. Gear drives

Gear tooth terminology – involute and cycloidal profiles - Simple, compound, reverted & Epi cyclic gear trains. Gear material - Law of gearing-Design of number of teeth for simple, compound and reverted gear trains for a given speed ratio and sketching the arrangement-Applications of gear trains – thread cutting on a lathe – back gear assembly of a lathe-Selection of gear wheels to cut threads for a given pitch on a lathe-Design of spur gear based on Lewis equation-Problems on screw cutting on lathe – Back gear assembly - 3- Speed gear box of an automobile, Calculation of velocity ratio-Description and application of epi-cyclic gear trains (Problems on epi-cyclic gear trains not included)

3. Fly wheels and Governors

Purpose and applications of fly wheels – Definitions of Coefficient of fluctuation of speed and Coefficient of fluctuation of energy - Turning moment diagram of flywheels-Design of rim type flywheel knowing the fluctuation of energy - Formula for energy stored by fly wheel (without proof) – simple problems - Governor – function – Classification - Explanation of Simple Watt governor and Porter governor - Difference between Flywheel and Governor - Sensitiveness, Stability, Isochronism, Hunting, Effort and Power of governor - Simple problems on watt governor and porter governor.

4. Brakes and clutches

Function of brakes – Classification of brakes-Brake materials - Working of simple shoe brake and band brakes only - Simple problems on shoe brake and band brakes only - Function of clutch – Classification of clutches- Clutch material - Working of single plate and multi-plate clutches, Difference between Brake and clutch - Simple problems on single plate and multi-plate clutches based on uniform pressure and uniform wear

5. Cams

Function of cam - Classification of cams and followers – uses. Working principle of plate and cylindrical cams - Nomenclature of radial cam - Explanations of terms cam profile, base-circle, cam angles, trace point - Motion of follower – Uniform velocity, uniform acceleration and retardation and simple harmonic motion – Time Vs. displacement diagram only - Construction of cam profile of a plate cam with knife edged, flat & roller follower for all three types of motions stated above - Problems on drawing of cam profiles as stated above for the follower axis passes through the axis of the cam shaft (offset followers not included)

REFERENCES

1. Machine Design - R.S.Khurmi.
2. Design of Machine Elements - Pandya and Shah.
3. Theory of machines- Thomas Bevan.
4. Design of Machine Elements – V B Bhandari [Tata Mc Graw Hill]

ESTIMATING AND COSTING

Subject Title : Estimating and Costing
Subject Code : ME-503
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1.	Elements of costing	12	21	02	1 ½
2.	Fundamentals of estimation	06	08	01	½
3	Estimation of weights of materials and Machining times	16	39	03	03
4.	Estimation of fabrication cost	08	13	01	01
5.	Estimation of forging cost	10	16	02	01
6.	Estimation of foundry cost	08	13	01	01
Total		**60**	**110**	**10**	**08**

OBJECTIVES

Op on completion of the course the student shall be able to

1.0 Understand the elements of costing.
- 1.1 Define Costing
- 1.2 List the objectives of costing
- 1.3 Explain the elements of costing
- 1.4 Define Depreciation
- 1.5 Explain the causes of depreciation
- 1.6 Compute depreciation by different methods.
- 1.7 Explain the components of cost - prime cost, factory cost, office cost, total cost
- 1.8 Calculate the cost of a product taking into consideration all the items.
- 1.9 Calculate the selling price of a Product.

2.0 Understand the fundamentals of estimation.
- 2.1 Define Estimation.
- 2.2 List the qualities of Estimator.
- 2.3 List the objectives and functions of estimation.
- 2.4 Explain the various constituents of estimation.
- 2.5 Explain the estimating procedure.

3.0 Estimate the weight of material required for a product and machining times

3.1 Divide the component drawing into simple and smaller geometrical configurations.
3.2 Calculate the volumes and the weight of the material required.
3.3 Estimate the cost of material.
3.4 Solve simple problems on the above.
3.5 Estimate time required for machining like turning, drilling, shaping, boring, screw cutting and grinding.
3.6 Use standard tables for feeds, cutting speeds.
3.7 Solve problems on the above.

4.0 Estimate the fabrication cost.

4.1 Define the Meaning of Fabrication
4.2 List the types of fabrication.
4.3 Estimate the cost of Fabrication by Gas welding – using table
4.4 Estimate the cost of Fabrication by Arc welding .
4.4 Estimate the cost of Gas cutting – using table

Note: Use Gas welding & Gas cutting table for obtaining consumption of gas, filler rods, rate of welding, speed of cutting.

5.0 Estimate forging cost.

5.1 Define Forging.
5.2 List the types of forging
5.3 Explain various forging losses.
5.4 Estimate the length, net and gross weight and cost of forging for a given component.

6.0 Estimate foundry cost.

6.1 List steps for making castings in foundry.
6.2 Explain the allowances provided in foundry.
6.3 State the various costs involved in estimating foundry cost
6.4 Estimate foundry cost.

COURSE CONTENT

1.0 Elements of costing.

Explanation of term costing – objectives of cost accounting – elements of cost viz., material, labour and expenses –Depreciation-causes- : Calculation of depreciation charges by a few important methods.
Determine the items that go into prime cost. On cost, calculate the cost of a product taking into consideration all items. Calculate the selling price of a product.

2.0 Fundamentals of estimating

Explanation of the term, objectives and function of estimating – principal constituents of the estimating of the cost of component – design time, drafting, planning and production time, design and procurement or manufacture of special tools and equipment, estimate work, labour, materials, overheads, miscellaneous expenses – estimating procedure.

3.0 Estimation of weights of materials and machining time.

Principles of dividing the component drawing into simple and smaller geometrical configurations. Calculation of volumes and the weight of the material. Estimating the cost Exercises in the calculation of weight of material and cost.

Basic formula for the calculation of machining times for operations like, turning, drilling, shaping, boring, screw cutting and grinding,. Use of standard table of feeds, cutting speed etc. Exercises for the calculation of machining time for the above mentioned operations.

4.0 Estimation of fabrication cost.

Explain the term fabrication – types, estimate the cost of fabrication by gas welding and arc welding – estimate the cost of gas cutting – exercises for the calculation of fabrication cost.

5.0 Estimation of forging cost.

Components of forging cost, estimation of stock weight, net weight, gross weight, losses in forging, estimation of stock size.

Exercise in the estimation of length, net and gross weight and cost of forging for given components.

6.0 Estimation of foundry cost.

Process for finding the foundry cost, cost of metal, cost of metal melting, moulding cost, core cost, cleaning cost, grinding and tooling cost. Methods of estimating the above. Exercises in estimating the foundry cost.

REFERENCE BOOKS

1. Mechanical Estimating & Costing -by B.P.Sinha
2. Industrial Engineering & Management Science. - by T.R.Banga
3. Estimating & Costing - by Agarwal.
4. Estimating & costing -by Narang & charya.
5. Estimating & Costing -by T.R. Banga – Sharma.

HEAT POWER ENGINEERING - II

Subject Title : Heat Power Engineering - II
Subject Code : ME-504
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Properties of Steam	10	20	02	01
2	Steam Boilers	15	32	02	02
3	Steam Nozzles	10	18	02	1 ½
4	Steam Turbines	15	20	02	02
5	Steam Condensers	10	20	02	1 ½
	Total	**60**	**110**	**10**	**08**

OBJECTIVES
Up on completion of the course the student shall be able to

1.0 Understand the Properties of Steam
- 1.1 Define the various properties of steam
- 1.2 Compute the enthalpy, internal energy and entropy at given pressure.
- 1.3 Use of the steam tables
- 1.4 Interpret the data in steam tables to calculate enthalpy and entropy.
- 1.5 Compute the above values using Mollier chart.
- 1.6 Solve simple problems on the above.
- 1.7 Identify the various thermodynamic processes (Expansion & Compression of vapours)
- 1.8 Compute the work done, internal energy, enthalpy and entropy in each of the above processes.
- 1.9 Represent the above process on T-S and H-S diagrams
- 1.10 Calculate dryness fraction by using Steam calorimeters

2.0 Understand the Working of Steam Boilers.
- 2.1 State the function of boiler
- 2.2 List all the uses of boilers.
- 2.2 Explain the working of Cochran Boiler with a legible sketch
- 2.3 Explain the working of Babcock Wilcox Boiler with a legible sketch
- 2.4 Distinguish between water tube and fire-tube boilers
- 2.5 Recognise the need of high-pressure modern boilers
- 2.6 Explain the working principle of Lamont and Benson Boilers with a legible sketch
- 2.7 List all the boiler mountings
- 2.8 Explain the function all the mountings with a legible sketch such as pressure gauge, water level indicator, safety valve and fusible plug.

2.9 List all the boiler accessories.
2.10 Illustrate the function of all the accessories with a legible sketch such as economiser, Super Heater, Steam traps & Separators.
2.11 Explain the terms actual/equivalent evaporation and factor of evaporation.
2.12 Define the boiler Power
2.13 Define the boiler efficiency
2.14 Write the formula for the above.
2.15 Compute the equivalent and actual evaporation from given data.
2.16 Solve problems on Boiler Power & efficiency
2.17 Draw heat balance for boiler performance
2.18 Explain draught systems (Natural, forced & induced) in detail with a legible sketch

3.0 Understand the Working of Steam Nozzles

3.1 Explain the Flow of steam through nozzle
3.2 Derive the expression for Velocity of steam at the exit of nozzle in terms of heat drop analytically and by using Mollier chart.
3.3 Calculate Velocity of steam at the exit of nozzle in terms of heat drop analytically and by using Mollier chart.
3.3 Write the expression for Discharge of steam through nozzles
3.4 Write the formula for Critical pressure ratio
3.5 Calculate cross-sectional areas at throat and exit for maximum discharge
3.6 Explain the Effect of friction in nozzles and Super saturated flow in nozzles.
3.7 Explain the Working of steam jet injector with a legible sketch.
3.8 Solve simple problems of nozzles.

4.0 Understand the Working of Steam Turbines

4.1 Explain the principle of working of a turbine
4.2 Classify the Turbines with examples.
4.3 Differentiate the impulse turbines from reaction turbine
4.4 Explain the Principle of working of simple De-Laval turbine with a line diagram.
4.5 Draw velocity triangles
4.6 List the various blade angles
4.7 Derive formula for work done, axial thrust, energy lost, power and efficiencies.
4.8 State the necessity of compounding a turbine.
4.9 Describe the methods of reducing rotor speeds with the help of legible sketch (3 compounding methods)
4.10 Explain the working principle of Parson's Reaction Turbine with a line diagram.
4.11 Velocity triangle for Parson's reaction turbine.
4.12 Simple problems on Single stage Impulse turbines (without blade friction) and reaction turbines (including data on blade height)
4.13 Define the terms bleeding & reheating.
4.14 State the necessity of governing a turbine
4.15 Explain the methods of turbine governing

5.0 Understand the Working of Steam Condensers

5.1 Define the Steam condenser

5.2 State the functions of steam condenser
5.3 Classify the condensers
5.4 Explain the working principle of Low level counter – Flow and Parallel – Flow jet condensers with legible sketch
5.5 Explain the working principle of High level Jet condenser with legible Sketch
5.6 List the Advantages and Disadvantages of High- Level Jet condenser
5.7 Explain the working principle of Ejector condenser with legible Sketch
5.8 Explain the working principle of Shell and Tube Surface condenser with Legible sketch
5.9 Distinguish between down flow and central flow surface condenser
5.10 Explain the working principle of Evaporative condenser with legible Sketch
5.11 List the Advantages and Disadvantages of Surface condenser
5.12 Distinguish between Jet Condenser and Surface Condenser
5.13 Write the Formulae for cooling water required, Condenser efficiency, Corrected vacuum, absolute pressure and Vacuum efficiency
5.14 Solve Simple problems on Steam condensers to Estimate the Cooling water required, Condenser efficiency and Vacuum efficiency
5.15 Define Air Extraction
5.16 List the types of Air Extraction systems
5.17 Distinguish between Dry-air Extraction and Wet-air Extraction systems
5.18 Explain the working principle of Air pump and Steam –Jet Air Ejector with legible sketch

COURSE CONTENT

1.0 Properties of steam.

1.1 Formation of steam under constant pressure, dryness, fraction and degree of superheat, specific volume.
1.2 Determination of enthalpy, internal energy, internal latent heat, entropy of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart.
1.3 Simple direct problems on the above using tables and charts.
1.4 Vapour processes – simple problems using tables and charts.
1.5 Steam calorimeters – Separating, throttling, Combined Separating and throttling calorimeters – problems.

2.0 Steam Boilers.

2.1 Function and use of steam boilers.
2.2 Classification of steam boiler with examples.
2.3 Brief explanation with line sketches of Cochran and Babcock Wilcox Boilers.
2.4 Comparison of water tube and fire tube boilers.
2.5 Description with line sketches and working of modern high pressure boilers Lamont and Benson boilers.
2.6 Brief explanation with line sketches of boiler mountings namely, pressure gauge, water level indicator, fusible plug, blow down cock, stop valve, safety valve (dead weight type, spring loaded type, high pressure and low water safety alarm).

2.7 Brief explanation with line sketches of boiler accessories such as feed pump, economiser, super heater and air pre-heater only.
2.8 Study of steam traps & separators.
2.9 Explanation of the terms : Actual evaporation, equivalent evaporation, factor of evaporation, boiler horse power and boiler efficiency.
2.10 Formula for the above terms without proof.
2.11 Simple direct problems on the above.
2.12 Draught systems (Natural, forced & induced).

3.0 Steam Nozzles

3.1 Flow of steam through nozzle.
3.2 Velocity of steam at the exit of nozzle in terms of heat drop by analytical and mollier diagram.
3.3 Discharge of steam through nozzles.
3.4 Critical pressure ratio.
3.5 Methods of calculation of cross – sectional areas at throat and exit for maximum discharge.
3.6 Effect of friction in nozzles and Super saturated flow in nozzles.
3.7 Working steam jet injector.
3.8 Simple problems of nozzles.

4.0 Steam Turbines

4.1 Classification of steam turbines with examples.
4.1 Difference between impulse & reaction turbines.
4.3 Principle of working of a simple De-lavel turbine with line diagrams.
4.4 Velocity diagrams.
4.5 Expression for work done, axial thrust, tangential thrust, blade and diagram efficiency, stage efficiency, nozzle efficiency.
4.6 Methods of reducing rotor speed compounding for velocity, for pressure or both pressure and velocity.
4.7 Working principle with line diagram of a Parson's Reaction turbine – velocity diagram.
4.8 Simple problems on single stage impulse turbines (without blade friction) and reaction turbine including data on blade height.
4.9 Bleeding, re-heating and re-heating factors (Problems omitted).
4.10 Governing of steam turbines : Throttle, By-pass & Nozzle control governing.

5.0 Steam Condensers

5.1 Steam condenser ,its functions, Classifications
5.2 Low level counter – Flow and Parallel –
Flow jet condensers, High level Jet condenser and Ejector condenser, Advantages and Disadvantages of High- Level Jet condenser
5.3 Shell and Tube Surface condenser, Down flow, Central flow Surface Condenser and Evaporative condenser, Advantages and Disadvantages of Surface condenser
5.4 The Formulae for cooling water required, Condenser efficiency, Corrected vacuum, Absolute pressure and Vacuum efficiency
5.5 Simple problems on Steam condensers to Estimate the Cooling water Required, Condenser efficiency and Vacuum efficiency

5.6 Air Extraction, Types of Air Extraction systems, Dry-air Extraction and Wet-air Extraction systems, Air pump and Steam –Jet Air Ejector

REDERENCE BOOKS

1. Thermodynamics	by	Ballaney
2. Elements of Heat Engines – Volume II	by	R.C. Patel & Karamchandani
3. Thermal Engineering	by	Arora & S. Domkundwar
4. Thermal Engineering	by	Roy & Sarao
5. Thermal Engineering	by	Vasandani & Kumar

FLUID POWER SYSTEMS

Subject Title : Fluid Power Systems
Subject Code : ME-505
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

S No.	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Fluid power	06	13	01	01
2	Circuit devices	12	26	02	02
3	Pneumatics	20	42	04	03
4	Hydro - Pneumatic systems	12	16	02	01
5	Hydro – Pneumatic measurements	10	13	01	01
	Total	60	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the concept of Fluid power

1.1 Explain the meaning of fluid power
1.2 List the various applications of fluid power
1.3 List the basic components of the fluid power system
1.4 Appreciate the use of Hydraulic control system
1.5 State merits and demerits of hydraulic control system.
1.6 State the essential components of hydraulic circuits and their functions.
1.7 List types of Hydraulic pumps
1.8 List the types of Hydraulic Motors.
1.9 Explain the function of hydraulic pump and motor

2.0 Understand the Working of Circuit devices

Hydraulic Intensifier

2.1 State the purpose of intensifier
2.2 Explain the principal of working of intensifier with a legible sketch
2.3 List the types of accumulators.
2.4 List the types of hydraulic cylinders
2.5 Explain the construction and working principle of double acting hydraulic cylinder
2.6 Write the expressions for force, velocity and power for hydraulic cylinder
2.7 Select intensifiers and accumulators for specific application.
2.8 Explain the principle of Hydraulic Jack with a legible sketch
2.9 Explain the principle of Hydraulic crane with a legible sketch

Hydraulic control valves - Directional

2.10 State the function of control valve
2.11 Classify the control valves
2.12 State the functions of Directional control valves
2.13 Classify the directional control valves
2.14 Explain the construction and working principle of directional control valve
2.15 Draw the graphic symbols of directional control valves
2.16 Explain the different applications of directional control valves
2.17 Explain the working principle of solenoid-actuated valve with a legible Sketch
2.18 Define the valve overlap

Pressure control valves

2.19 State the functions of Pressure control valves
2.20 Classify the Pressure control valves
2.21 Explain the construction and working principle of pressure control valve
2.22 Draw the graphic symbols of pressure control valve
2.23 Explain the different applications of pressure control valves

Flow control valves

2.24 State the functions of Flow control valves
2.25 Classify the Flow control valves
2.26 Explain the construction and working principle of flow control valve
2.27 Draw the graphic symbols of flow control valve
2.28 Explain the different applications of Flow control valves
2.29 Explain the working of bleed-off circuits

Oil Reservoirs

2.30 State the functions of oil reservoir
2.31 Identify the elements of a Fluid Reservoir
2.32 Explain the purpose and types of filters
2.33 Explain the purpose of seals and packings.
2.34 Identify the different types of seals and packings.

3.0 Understand the concept of Pneumatics

Pneumatic Power Unit

3.1 Explain the meaning of pneumatic circuits
3.2 State the elements of pneumatic circuits
3.3 State the areas of application of pneumatic power unit
3.4 Compare with hydraulic power unit
3.5 Identify different symbols used for pneumatic circuit
3.6 Draw the pneumatic circuit diagram.
3.7 Classify the compressors.
3.8 Explain the working of Regulator, Filter and Lubricator (R-F-L)

Pneumatic circuit valves

3.9 Explain the function of circuit valves.
3.10 Explain the different methods of actuation of valves.
3.11 Describe the direction control valves – Spool type.

Air Cylinders

3.12 List the types of air cylinders
3.13 Explain the factors pertaining to installation and maintenance of Air cylinders
3.14 List the applications of Air cylinders

Pneumatic Circuits

3.16 Explain the principle of working of power operator holding devices.
3.17 Explain the pneumatic safety circuits.
3.18 Explain the meaning of Remote control
3.19 Describe the components of Remote control system.
3.20 Explain different Remote control valves and switches.

4.0 Understand the concept of Hydro Pneumatic Systems

4.1 Explain the advantages and applications of combined air and oil systems.
4.2 Explain the principle of combination system.
4.3 Explain the methods of combining the hydraulic cylinder to Air cylinder.
4.4 Explain the principle of Air controlled hydraulic valve with a legible sketch
4.5 Describe the use of air as cushion for hydraulics system with a legible sketch

5.0 Understand the concept of Hydro Pneumatic measurements

5.1 Illustrate the working of flow meter (Mechanical Type) with a legible sketch
5.2 Illustrate the working of flow meter (Electro Magnetic Type) with a legible sketch
5.3 Illustrate the working of flow meter (Ultrasonic) with a legible sketch
5.4 Illustrate the working of Air gauge with a legible sketch

COURSE CONTENT

1.0 Fluid Power

1.1 The meaning of fluid power
1.2 The various applications of fluid power
1.3 The basic components of the fluid power system
1.4 The use of Hydraulic control system
1.5 The merits and demerits of hydraulic control system.
1.6 The essential components of hydraulic circuits and their functions.
1.7 The types of Hydraulic pumps
1.8 The types of Hydraulic Motors.
1.9 The function of hydraulic pump and motor

2.0 Circuit devices

Hydraulic Intensifier

2.1 The purpose of intensifier
2.2 The principal of working of intensifier with a legible sketch
2.3 The types of accumulators.
2.4 The types of hydraulic cylinders
2.5 The construction and working principle of double acting hydraulic cylinder
2.6 The expressions for force, velocity and power for hydraulic cylinder
2.7 The Selection of intensifiers and accumulators for specific application.
2.8 The principle of Hydraulic Jack with a legible sketch
2.9 The principle of Hydraulic crane with a legible sketch

Hydraulic control valves - Directional

2.10 The function of control valve
2.11 The control valves
2.12 The functions of Directional control valves
2.13 Classification of directional control valves
2.14 The construction and working principle of directional control valve
2.15 The graphic symbols of directional control valves
2.16 The different applications of directional control valves
2.17 The working principle of solenoid-actuated valve with a legible Sketch
2.18 Definition of the valve overlap

Pressure control valves

2.19 The functions of Pressure control valves
2.20 Classification of Pressure control valves
2.21 The construction and working principle of pressure control valve
2.22 The graphic symbols of pressure control valve
2.23 The different applications of pressure control valves

Flow control valves

2.24 The functions of Flow control valves
2.25 Classification the Flow control valves
2.26 The construction and working principle of flow control valve
2.27 The graphic symbols of flow control valve
2.28 The different applications of Flow control valves
2.29 The working of bleed-off circuits

Oil Reservoirs

2.30 The functions of oil reservoir
2.31 Identification of elements of a Fluid Reservoir
2.32 The purpose and types of filters
2.33 The purpose of seals and packings.
2.34 Identification of different types of seals and packings.

3.0 Pneumatics

Pneumatic Power Unit

3.1 The meaning of pneumatic circuits
3.2 The elements of pneumatic circuits
3.3 The areas of application of pneumatic power unit
3.4 Comparison with hydraulic power unit
3.5 Identification of different symbols used for pneumatic circuit
3.6 The pneumatic circuit diagram.
3.7 Classification of compressors.
3.8 Explanation of working of Regulator, Filter and Lubricator (R-F-L)

Pneumatic circuit valves

3.9 Explanation of function of circuit valves.
3.10 Explanation of different methods of actuation of valves.
3.11 The direction control valves – Spool type.

Air Cylinders

3.12 The types of air cylinders

3.13 Function of Air cylinder – Tube, Cover, Packing gland, Cushion assembly, Piston and Piston seal.
3.14 Explanation of factors pertaining to installation and maintenance of Air cylinders
3.15 The applications of Air cylinders

Pneumatic Circuits

3.17 Explanation of principle of working of power operator holding devices- Lever clamp, Toggle clamp, Power vice, Mandrels, Collets and chucks.
3.18 Explanation of pneumatic safety circuits for a) Protection against pressure drop, b) Protection against overload
3.19 Explain the meaning of Remote control
3.20 The components of Remote control pneumatic system – Pilot operated valves, Solenoid valves, and Cam operated valves
3.21 Explain different Remote control valves and switches.

4.0 Hydro Pneumatic Systems

4.1 The principle of combination system.
4.2 The advantages and applications of combined air and oil systems
4.3 The methods of combining the hydraulic cylinder to Air cylinder
4.4 The principle of Air controlled hydraulic valve with a legible sketch
4.5 The use of air as cushion for hydraulics system with a legible sketch

5.0 Hydro Pneumatic Measurements

5.1 Illustratation of working of flow meter (Mechanical Type) with a legible sketch
5.2 Illustratation of working of flow meter (Electro Magnetic Type) with a legible sketch
5.3 Illustratation of working of flow meter (Ultrasonic) with a legible sketch
5.4 Illustratation of working of Air gauge with a legible sketch

REFERENCE BOOKS:

1. Pneumatics by SRIHARI RAO
2. Pneumatic controls by FESTO
3. Fluid Power Pneumatics by ALAN H. JOHN
4. Pneumatics by FLIPPO
5. Pneumatics By TTI
6. Hydraulics & Pneumatics by RAY & RAO
7. Fluid Power & Pneumatics by AUDEL Series

MACHINE TOOL ENGINEERING

Subject Title : Machine Tool Engineering
Subject Code : ME–506
Periods Per Week : 04
Periods Per Semester : 60

TIME SCHEDULE

S.No	Major Topics	Number of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Modern Machining Process	16	29	03	02
2	Plastic processing	16	26	02	02
3	Press Tools, Jigs and Fixtures	20	42	04	03
4	Jig Boring	08	13	01	01
	Total	60	110	10	08

OBJECTIVES
Up on completion of the course the student shall be able to

1.0 Understand the Modern Machining Processes

1.1 Distinguish between non-conventional machining processes and traditional methods.
1.2 State their relative advantages.
1.3 Explain the principle of working of ultrasonic machining.
1.4 List the equipment used in U.S.M. processes.
1.5 Explain the principle of electric discharge machining with a legible sketch.
1.6 Explain the working of Abrasive jet machining with a legible sketch
1.7 Explain the working of Laser beam machining with a legible sketch
1.8 State the principle of chemical machining.

2.0 Understand the concept of Plastic Processing

2.1 State the principle of manufacturing plastic products.
2.2 Explain the methods of injection moulding, compression moulding, transfer moulding with legible sketches
2.3 Explain the principle of extruding, casting and calendaring with legible sketches
2.4 State the principle of machining and welding plastics
2.5 Explain the different fabrication methods – Sheet forming, Blow moulding, Laminating and Reinforcing
2.6 List Engineering applications of plastics

3.0 Understand the use of Press Tools, Jigs and Fixtures

3.1 Explain the Importance of Press Tools
3.2 Classify presses based on power and design of frame.
3.3 Explain the constructional details of a power press with the help of a legible sketch
3.4 State the meaning of Press size.
3.5 Explain Press Tools – Punch and die.
3.6 Explain Die-clearance and Die Accessories
3.7 Explain shear action in die cutting operation – Punch and die clearances, Angular clearance, centre of pressure, cutting forces.
3.8 Explain various press working operations.
3.9 Explain different types of dies.
3.10 List various die operations
3.11 List types of jigs and explain their constructional details with the help of legible sketches
3.12 State general considerations in design of drill jigs
3.13 State the function of drill bush.
3.14 List different types of fixtures and explain their constructional details with the help of legible sketches.
3.15 Differentiate between jigs and fixtures.
3.16 List the advantages of Jigs and Fixtures
3.17 Explain basic principle of location.
3.18 Identify different locating methods and devices.
3.19 Explain the basic principle of clamping.
3.20 Identify different types of clamps and their constructional details with the help of legible sketches

4.0 Understand the process of Jig Boring

4.1 List the situations where jig-boring machines are needed.
4.2 State the principle of working of a jig boring machine.
4.3 Explain the process of button boring on lathes.
4.4 Classify the jig boring machines.
4.5 Explain the constructional details of open front machine and cross rail type machine with the help of legible sketches.
4.6 Explain the function of above machines.
4.7 Describe the systems of location of holes.

COURSE CONTENT

1.0 Modern Machining Processes.

Introduction – comparison with traditional machining.
Ultrasonic machining- Principle – Description of equipment - applications.
Electric Discharge Machining - Principle – Description of equipment – Type of EDM Processes - applications.
Abrasive jet machining - principle - description of equipment – application.
Laser beam machining - principle - description of equipment- application.
Chemical machining – Principle – description of equipment - Applications.

2.0 Plastics Processing.

Processing of plastics - Injection moulding - Compression moulding - Transfer moulding – Extruding - Casting - Calendaring
Fabrication methods -Sheet forming methods, Blow moulding -

Laminating plastics (sheets, rods & tubes) - Tool angles for machining Plastics - Coolants used in machining of plastics - Applications of Plastics

3.0 Press Tools, Jigs and Fixtures:

Introduction - Types of Presses – hand, power, gap, inclinable, adjustable, horn, straight side, pillar presses.
Constructional details of a power press - Press size.
Press Tools – Punch and die
Die Accessories – Stops, Pilots, strippers, Knock outs, pressure pads.
Shear action in die cutting operation – punch and die clearance and angular clearance, centre of pressure, cutting forces.
Press working operations: blanking, piercing and forming, lancing, cutting off and parting, notching, shaving, trimming, embossing, beading and curling, bulging, twisting, coining, swaging, hole flanging or extruding – line sketches and meaning of terms.
Sheet metal bending: bending methods, spring back, bend allowance, bending pressure – sketches and empirical formulae.
Types of dies meaning of inverted, progressive, compound and combination dies.
Material selection for punch and die.
Definition of jig - Types of jigs - leaf jig, box and handle jig, template jig, plate jig, Indexing jig, Universal jig, vice jigs.
Explain the constructional details of the above jigs.
General consideration in the design of drill jigs
Explain drill bush
Types of fixtures : vice fixtures, milling fixtures, boring fixtures, grinding fixtures - Explain the constructional details of the above fixtures.
Basic principles of location - Explain the locating methods and devices
Explain the basic principles of the clamping - Types of clamps - strap clamps, cam clamps, screw clamps, toggle clamps, hydraulic and pneumatic clamps.

4.0 Jig Boring.

Introduction - Button boring on lathes- Jig boring on vertical milling machine.
Types jig boring machines - Open front machine - Cross rail type machine constructional details & their working - System of location of holes.

REFERENCE BOOKS

1.Manufacturing Technology - Hajra Chowdhary Volume I & II
2.Manufacturing Technology - P.N.Rao Volume II
3.Production Technology - R.C.Patel
4.Production Technology - Jain & Gupta.
5.Tool Design - Donaldson

CAD PRACTICE

Subject Title : CAD Practice
Subject Code : ME–507
Periods per week : 06
Period per semester : 90

TIME SCHEDULE

Sl No.	Major Topics	No. of periods
1.	Introduction to CAD	03
2.	Selecting commands & Working with drawing	06
3.	Viewing drawing	03
4.	Working with coordinates	03
5.	Creating simple and complex entities	06
6.	Getting Drawing information	06
7.	Modifying entities	06
8.	Working with text	03
9.	Dimensioning drawing	03
10.	2D Drawing	21
11.	Layers	03
12.	Isometric views	06
13.	Working with blocks	03
14.	Printing drawing	03
15.	3D Drawings	15
TOTAL		90

OBJECTIVES
Up on completion of the course the student shall be able to

1.0 Understand about the Computer Aided Drafting and its software
- 1.1 Define Computer Aided Drafting
- 1.2 List the Advantages of CAD
- 1.3 Explain the importance of CAD software
- 1.4 Explain the features of Graphic Work station
- 1.5 Use CAD Environment: Screen, Various tool bars and menus.

2.0 Use appropriate selection commands

2.1 Practice commands using toolbars, menus, command bar
2.2 Practice repeating a command, Nesting a command and modifying a command
2.3 Use prompt history window and scripts
2.4 Practice mouse shortcuts
2.5 Practice the Creating the drawing, Opening existing and damaged Files, saving the drawing
2.6 Practice the setting up a drawing
2.7 Practice the setting and changing the grid and snapping alignment
2.8 Practice the Entity snaps

3.0 Use Viewing tools of CAD

3.1 Practice the use of Scroll bar, pan command, and rotating view to move around within drawing
3.2 Practice the changing of magnification of drawing
3.3 Practice the displaying of multiple views
3.4 Practice the use of controlling visual elements like Fill, Text, Blips and Line weight

4.0 Use coordinate systems of the drawing

4.1 Practice how the coordinate system work
4.2 Practice how the coordinate system displayed
4.3 Practice the Find tool to determine the coordinates of a point
4.4 Practice the Two dimensional coordinates such as Absolute Cartesian, Relative Cartesian and Polar coordinates
4.5 Practice the use of right-hand rule
4.6 Practice the how to enter into x, y, z - coordinates
4.7 Practice the Three dimensional coordinates such as Spherical and Cylindrical coordinates
4.8 Practice the use of filters in two and three dimensions
4.9 Practice the defining user coordinate system
4.10 Practice the use of present user coordinate system

5.0 Create the simple and complex entities

5.1 Draw the lines, circles, arcs, ellipses, elliptical arcs, rays and infinite lines
5.2 Practice the Creation of point entities
5.3 Practice the Editing of point entities
5.4 Draw the complex shapes like rectangles, polygons, polylines, Splines, donuts, planes
5.5 Practice the adding of hatch pattern

6.0 Use the drawing information retrieving tools Measure, Divide, Calculate, Display, and Track

6.1 Measure the intervals on entities
6.2 Divide the entities in to segments
6.3 Calculate the areas defined by points, of closed entities, and Combined entities
6.4 Calculate the distance between the entities
6.5 Calculate the angle between the entities
6.6 Display the information about the entities and drawing status

6.7 Track time spent working on a drawing

7.0 Use the Modifying tools to modify the properties of entities

7.1 Practice the entity selection and deselection methods
7.2 Practice the Deletion of entities
7.3 Practice the Copying of entities within a drawing, between drawings
7.4 Practice the making of parallel copies, Mirroring entities and Arraying entities
7.5 Practice the Rearranging of entities by Moving, Rotating and Reordering
7.6 Practice the Resizing of entities by Stretching, Scaling, Extending, Trimming, and Editing the length
7.7 Practice the Braking and joining of entities
7.8 Practice the creating, modifying the groups and ungrouping of Entities
7.9 Practice the Editing of polylines: Opening, Closing, Curving, Decurving, Joining, Changing width and editing vertices
7.10 Practice the Exploding of entities
7.11 Practice the Chamfering and Filleting of entities

8.0 Use the Text tool to create and formatting the various types of text fonts and its styles

8.1 Practice the creating, naming and modifying the text fonts
8.2 Practice the Creation of line text, paragraph text
8.3 Practice the Setting of line text style and its alignment
8.4 Practice the Setting of Paragraph text style and its alignment
8.5 Practice the Changing of line text and Paragraph text
8.6 Practice the use of alternate text editor

9.0 Use Dimensioning concepts to create dimensions, Edit dimensions, Control dimension styles & variables and Adding geometric tolerances

9.1 Practice the creating of linear, Angular, Diametral, Radial, Ordinate dimensions
9.2 Practice the creating leaders and annotations
9.3 Practice the making dimensions oblique
9.4 Edit the dimension text
9.5 Practice the Controlling of dimension arrows and format
9.6 Practice the Controlling of line settings and dimension text
9.7 Practice the Controlling of dimension units, and dimension tolerance

10.0 Create 2D Drawings

10.1 Create 2D drawings of standard mechanical components

11.0 Organize the information on layers

11.1 Practice the setting a current layer, layers color, line type, line weight, print style
11.2 Practice the locking and unlocking of layers
11.3 Practice the layer visibility and layer printing
11.4 Practice the setting of current line type
11.5 Practice the loading of additional line types
11.6 Practice the creating and naming of line type

11.7 Practice the editing of line type

12.0 Create Isometric Views

12.1 Create Isometric views of simple objects

13.0 Use the Blocks, Attributes and External references to manage the Drawing

13.1 Define a block
13.2 Explain the purpose of a block
13.3 Practice the creating a block
13.4 Practice the inserting a block
13.5 Practice the redefining a block
13.6 Practice the exploding a block
13.7 Define an Attribute
13.8 Practice the editing attribute definitions
13.9 Practice the attaching attribute to blocks
13.10 Edit attributes attached to blocks
13.11 Extract attributes information
13.12 Define external reference
13.13 Practice the Attaching, Removing, and Reloading of external references
13.14 Practice the Binding, Clipping and changing the path of external References

14.0 Use Layouts, Layout view ports, and customizing printing in CAD

14.1 Define layout for printing
14.2 Understand the layouts
14.3 Practice the viewing of drawings in paper and model space
14.4 Display the model and layout tabs
14.5 Create the new layout
14.6 Reuse the layouts from other files
14.7 Manage the layouts in a drawing
14.8 Define layout view ports
14.9 Create layout view ports
14.10 Practice the viewing and scaling of layout view ports
14.11 Modify the layout viewports
14.12 Select the appearance of print dialog
14.13 Set the paper size and orientation
14.14 Select a printer or a plotter
14.15 Set the scale and view
14.16 Choose how line weight print

15.0 3D Drawings

15.1 Explain the concept of 3D
15.2 Create 3D solids using solid tool bar options
15.3 Create 3D Drawings of Standard Mechanical Components
15.4 Practice Rendering

KEY competencies to be achieved by the student

S.No	Experiment Title	Key Competency
1.	Introduction to CAD	• Open/close Autocad program • Understands Autocad Graphic User Interface(GUI) and various toolbars
2.	Selecting commands & Working with drawing	• Use prompt history window and scripts • Practice the setting up a drawing • Practice the Entity snaps
3.	Viewing drawing	• Use Scroll bar, pan command, and rotating view to move around within drawing • Control visual elements like Fill, Text, Blips and Line weight
4.	Working with coordinates	• Use Two dimensional coordinates and Three dimensional coordinates • Use right-hand rule • Use filters in two and three dimensions • Define user coordinate system
5.	Creating simple and complex entities	• Draw the simple shapes like lines, circles, arcs and complex shapes like polygons, planes etc., • Practice the adding of hatch pattern
6.	Getting Drawing information	• Measure the intervals and distance between entities • Divide the entities in to segments • Calculate the areas defined by points, of closed entities, and Combined entities
9.	Dimensioning drawing	• Create linear, Angular, Diametral, Radial, Ordinate dimensions • Practice the making dimensions oblique • Edit the dimension text • Practice the Controlling of dimension units, and dimension tolerance
10.	2D Drawings	• Use proper 2D commands to create 2D drawings
12.	Isometric Views	• Use Iso snap command to create Isometric views

S.No	Experiment Title	Key Competency
13.	Working with blocks	• Create , insert and explode a block Attach attribute to blocks • Edit and extract attributes attached to blocks
14.	Printing drawing	• Display the model and layout tabs • Create the new layout and Manage the layouts from other files • Practice the viewing, scaling and Modifying of layout view ports • Set the paper size, orientation, scale, view and line weight to print
15.	3D Drawings	• Region 2D Drawings • Use proper 3D commands to create 3D drawings

COURSE CONTENT

1.0 The Computer Aided Drafting and its software

Definition of Computer Aided Drafting, the Advantages and importance of CAD software ,The features of Graphic Work station, CAD Environment: Screen, Various tool bars and menus.

2.0 Selection of commands

Commands using toolbars, menus, command bar
Repeating a command, Nesting a command and modifying a command
Use of prompt history window and scripts, mouse shortcuts
Creating the drawing, Opening existing and damaged files, saving of drawing, setting up a drawing
Setting and changing the grid and snapping alignment, the Entity snaps

3.0 Use of viewing tools of CAD

Use of Scroll bar, pan command, and rotating view to move around within drawing, changing of magnification of drawing
Displaying of multiple views, the use of controlling visual elements like Fill, Text, Blips and Line weight

4.0 Use of coordinate systems of the drawing

Two dimensional coordinates such as Absolute, Cartesian, Relative Cartesian and Polar coordinates, the use of right-hand rule,
Three dimensional coordinates such as Spherical and Cylindrical Coordinates, the use of filters in two and three dimensions, Defining user Coordinate system

5.0 Creating simple and complex entities

Drawing of lines, circles, arcs, ellipses, elliptical arcs, rays and infinite lines, Creating and editing of point entities

Drawing of complex shapes like rectangles, polygons, polylines, Splines, donuts, planes, and adding of hatch pattern

6.0 Use the drawing information retrieving tools Measure, Divide, Calculate, Display, and Track

Measuring the intervals on entities, dividing the entities in to segments

Calculation of areas of defined by points, closed entities, and combined Entities, calculate the distance and angle between the entities

Displaying the information about the entities and drawing status

Tracking time spent working on a drawing.

7.0 Use the Modifying tools to modify the properties of entities

Entity selection and de selection methods, the Deletion of entities

Copying of entities within a drawing, between drawings, parallel copies, Mirroring entities and Arraying entities

The Rearranging of entities by Moving, Rotating and Reordering

The Resizing of entities by Stretching, Scaling, Extending, Trimming, and Editing the length

The Braking and joining of entities,The creating, modifying the groups and ungrouping of Entities

Editing of polylines: Opening, Closing, Curving, Decurving, Joining, Changing width and editing vertices,

The Exploding of entities, the Chamfering and Filleting of entities

8.0 Use the Text tool to create and formatting the various types of text Fonts and its styles

The creating, naming and modifying the text fonts, the Creation of line text, paragraph text, setting of line text style and its alignment

The Setting of Paragraph text style and its alignment, the Changing of line text and Paragraph text, the use of alternate text editor

9.0 Use Dimensioning concepts to create dimensions, Edit dimensions, Control dimension styles & variables and Adding geometric tolerances

The creating of linear, Angular, Diametral, Radial, Ordinate dimensions

The creating leaders and annotations, making dimensions oblique,

Editing the dimension text, controlling of dimension arrows and format

The Controlling of line settings and dimension text, the Controlling of dimension units, and dimension tolerance

10.0 2D Drawings

Using appropriate commands creation of 2D drawings of standard mechanical components

11.0 Organize the information on layers

Setting a current layer, layers color, line type, line Weight, print style

Locking and unlocking of layers, the layer visibility and layer printing

Setting of current line type, the loading of additional line types, creating and naming of line type, editing of line type

12.0 Isometric Views

Create Isometric views of simple objects

13.0 Use the Blocks, Attributes and External references to manage the Drawing Blocks

The purpose of a block, creating a block, inserting a block, redefining a block, exploding a block

Attribute

Editing attribute definitions, attaching attribute to blocks
Editing attributes attached to blocks, Extracting attributes information

External reference

Attaching, Removing, and Reloading of external references
The Binding, Clipping and changing the path of external references

14.0 Use the Layouts, Layout view ports, and customizing printing in CAD layout for printing

Layouts, Viewing of drawings in paper and model space, Displaying of model and layout tabs, creating the new layout, Reuse the layouts from other files, Manage the layouts in a drawing

Define layout view ports

Create layout view ports
Practice the viewing and scaling of layout view ports, Modify the layout viewports,

Select the appearance of print dialog

Setting the paper size and orientation, selecting a printer or a plotter
Setting the scale and view, choosing line weight

15.0 3D Drawings

3D drawings of standard components
Rendering of 3D images

REFERENCE BOOKS

4MCAD User Guide- IntelliCAD Technology Consortium (WWW.intellicad.org)

4MCAD Software:
1. 4MCAD Viewer,
2. 4MCAD Classic,
3. 4MCAD Standard,
4. 4MCAD Professional.

LIFE SKILLS
(Common to all branches)

Subject Title : **Life skills**
Subject Code : **ME – 508**
Periods per week : **03**
Period per semester : **45**

TIME SCHEDULE

Sl No.	Major Topics	No. of periods		
		Theory	Practical	Total
1.	Concept of life skills	03	00	03
2.	Enhancing self esteem	01	02	03
3.	Goal setting	01	02	03
4.	Positive attitude	01	02	03
5.	Managing emotions	1 1/2	4 1/2	06
6.	Stress management	1 1/2	4 1/2	06
7.	Time management	1/2	2 1/2	03
8.	Interpersonal skills	01	02	03
9.	Creativity	01	02	03
10.	Problem solving and Decision making skills	01	02	03
11.	Assertiveness	1 1/2	4 1/2	06
12.	Leadership skills &Team spirit	1 1/2	1 1/2	03
TOTAL		15 1/2	29 1/2	45

Note: No Written Examination
The students may be asked to Demonstrate 1 or 2 skills from unit 2 to unit 12.
Marks: Internal – 40; External - 60

OBJECTIVES
Upon the completion of the course the student shall be able to
1.0 Understand the concept of life skills
- 1.1 Define Life skills
- 1.2 Explain need and impact of Life skills programme
- 1.3 List the elements of Life skills
- 1.4 Identify the sources of Life skills

2.0 Understand the concept of Self esteem

2.1 Define the term self esteem
2.2 Explain the concept of self esteem
2.3 List the characteristics of High self esteem
2.4 List the characteristics of Low self esteem
2.5 Explain the advantages of High self esteem
2.6 Explain the behavior patterns of low self esteem
2.7 Explain the causes of Low self esteem
2.8 List the steps to build a positive self esteem

Practicals

Exp No	Exercise	Activity (Questionnaire / Game and Role play)
1.	Identifying the Behavior	• Identifying the behavior patterns of low self-esteem people.
2.	Practice Positive Self Esteem	• Steps to build a positive self esteem

3.0 Understand the concept of Goal setting

3.1 Define the term Goal
3.2 Explain the significance of Goal setting
3.3 Explain the following concepts
a) Wish b) Dream c) Goal
3.4 Explain the reasons for not setting goals
3.5 Explain the effective goal setting process
3.6 List the barriers to reach goals

Practicals

Exp No	Exercise	Activity
1	Differentiate among Wish, Dream and Goal	• Drawing a picture of Your Self/ Your Country/ Your Society after 10yrs. • Discussion: Setting Personal Goals • Story Telling • Identifying of barriers • Analysis of barriers • Overcoming Barriers

4.0 Practice positive attitude

4.1 Define Attitude
4.2 Explain the concept of positive attitude
4.3 Explain the concept of negative attitude
4.4 Explain the affects of negative attitude
4.4 Identify the attitude of self and peers
4.5 Explain the effect of peers on self and vice-versa.
4.6 List the steps to enhance positive attitude
4.7 Explain the strategies to enhance positive attitude

Practicals

Exp No	Exercise	**Activity** (Psychological Instrument/ Game & Role play)
1.	Identify Positive attitude	• To study & to identify the attitude of self and peers. • List & practice the strategies to enhance positive attitude.
2	Observe	• Positive attitudes of self and Peers • Negative attitudes of self and Peers
3	Practice Strategies to enhance Positive attitude	• Celebrating the success • Listing the successes

5.0 Practice managing emotions

5.1 Explain the concept of emotion
5.2 List the different types of emotions
5.3 Differentiate between positive and negative emotions
5.4 Identify the type of emotion
5.5 Explain the causes of different types of emotions.
5.6 Implement the methods to manage major emotions (anger / depression)
5.7 Define Emotional Intelligence.
5.8 Explain the method to enhance emotional Intelligence.

Practicals

Exp No	Exercise	**Activity** (Story / simulated situational act /GD & Role play)
1.	Identify the Type of Emotion	• To identify the type and to study the cause of the emotion.
2	Managing Emotions	• Managing major emotions -Anger and Depression

6.0 Practice stress management skills

6.1 Define Stress
6.2 Explain the concept of stress
6.3 List the Types of stress
6.4 Explain the causes of stress
6.5 Comprehend the reactions of stress
a) Physical b) Cognitive c) Emotional d) Behavioral
6.6 Explain the steps involved in coping with the stress by
a) Relaxation b) Meditation c) Yoga
6.7 Practice the stress relaxing techniques by the 3 methods.
a) Relaxation b) Meditation c) Yoga
6.8 Comprehend the changing personality and cognitive patterns.
6.9 Observe the changing personality and cognitive patterns.

Practicals

Exp No	Exercise	**Activity**(Questionnaire /Interview and practice)
1	Identify the type of stress	• To study & to identify the type and causes of stress.
2	Stress –Relaxation Techniques	• Practice some simple Stress –Relaxation Techniques, Meditation, Yoga.

7.0 Practice Time management skills

7.1 Define Time management.
7.2 Comprehend the significance of Time management.
7.3 Explain the strategies to set priorities.
7.4 List the steps to overcome barriers to effective Time management.
7.5 Identify the various Time stealers.
7.6 Explain the Time-Management skills.
7.7 List different Time-Management skills.
7.8 Comprehend the advantages of Time-Management skills.

Practicals

Exp No	Exercise	**Activity** (Group work and Games)
1	Identify Time stealers	• Assign a activity to different Groups – Observe the time of accomplishing the task, Identify the time stealers.
2.	Practice Time-Management skills	• Perform the given tasks- Games

8.0 Practice Interpersonal skills

8.1 Explain the significance of Interpersonal skills.
8.2 List the factors that prevent building and maintaining positive relationships.
8.3 Advantages of positive relationships.
8.4 Disadvantages of negative relationships

Practicals

Exp No	Exercise	**Activity**
1	Identify Relationships	• Positive Relationships, Negative Relationships – Factors that affect them- Through a story
2.	Practice Rapport building	• Exercises on Rapport building • Developing Correct Body Language

9.0 Understand Creativity skills

9.1 Define Creativity
9.2 List the synonyms like Invention , Innovatioin, Novelty
9.3 Distinguish between Creativity , Invention, innovation, and novelty

9.4 Discuss the factors that lead to creative thinking like observation and imitation , improvement etc.
9.5 Distinguish between Convergent thinking and divergent Thinking
9.6 Explain various steps involved in Scientific approach to creative thinking namely a) Idea generation b) Curiosity c) Imagination d)Elaboration e) Complexity
f). Abstract ion and simplification g). Divergent Thinking h) Fluency i). Flexibilty
j).Persistance k).Intrinsic Motivation l).Risk taking m).Projection/empathy
n).Originality o). Story telling p). Flow.
9.7 List the Factors affecting the creativity in Individuals.
9.8 Give the concept of Vertical thinking and lateral thinking.
9.9 Explain the importance of Lateral thinking.
9.10 Compare lateral thinking and Vertical thinking

Practicals

Exp No	**Exercise**	**Activity** (Games and Group work)
1	Observe any given object	• Identifying finer details in an object
2.	Imagine	• Imagining a scene • Modifying a story (introduce a twist) • Improving a product • Finding different uses for a product
3	Skills	• Making paper craft
4	Product development	• Brain storming session
5	Developing originality	• Come up with original solutions for a given problem

10.0 Understand Problem solving and decision making skills

10.1 Define a Problem
10.2 Analyze the performance problems
10.3 Categorize the problems
10.4 List the barriers to the solutions to problems.

Practicals

Exp No	**Exercise**	**Activity** (Brainstorming – checklist technique free association, attribute listing)
1	Gather the facts and Data and Organizing the information.	• Information gathering and organizing • Identifying the solutions to the problem • Identifying the barriers to the solutions • Zeroing on Optimum solution
2.	Problem solving	• Games on Problem solving

11.0 Understand Assertive and non Assertive behavior

11.1 List the 3 types of Behaviors 1. Assertive 2. Non assertive (passive) 3. Aggressive behaviour 4.Submissive behaiviors

11.2 Discuss the personality of a person having above behaviours
11.3 Explain the usefulness of assertive behavior in practical situations.
11.4 Explain the role of effective communication in reflecting assertive attitude
11.5 Give examples of Assertive statements a) Assertive request b) assertive NO
11.6 Explain the importance of goal setting
11.7 Explain the method of Conflict resolution.
11.8 Discuss the methods of controlling fear and coping up with criticism.

Practicals

Exp No	**Exercise**	**Activity** (Simulated situational act)
1	Observation of behavior	• Identifying different personality traits from the body language
2.	Practicing assertiveness	• Write statements • Reaction of individuals in a tricky situation • Facing a Mock interview • Detailing the characteristics of peers • setting goals – Games like throwing a coin in a circle • Giving a feedback on a)Successful program b) Failed project • Self disclosure
3	Skills	• Dealing with a critic • Saying NO • Dealing with an aggressive person
4	Simulation	• Role play- skit 1. Assertive statements 2. goal setting 3. self disclosure

12.0 Practice Leadership skills

12.1 Explain the concept of leadership
12.2 List the Traits of effective leader
12.3 Distinguish between Managing and leading
12.4 List the 3 leadership styles
12.5 Compare the above styles of leadership styles
12.6 Discuss choice of leadership style
12.7 Explain the strategies to develop effective leadership.
12.8 Explain the importance of Decision making
12.9 Explain the procedure for making effective decisions.

Practicals

Exp No	**Exercise**	**Activity** (Games and Group work)
1	Observation	• Questionnaire
2.	Identification of a Leader	• Give a task and observe the leader • Discuss the qualities and his /her leadership style • Ask the other members to identify the leadership qualities • Reflection on the self
3	Skills	• Decision making – followed by discussion
4	Building Team spirit	• Motivation – Intrinsic and Extrinsic Training- Communication- Challenge

Competencies for Practical Exercises

S.No	Title	Competency
1.	Concept of life skills	• Explain need and impact of Life skills
2.	Enhancing self esteem	• Follow the steps to build a positive self esteem
3.	Goal setting	• Practice the effective goal setting process
4.	Positive attitude	• Practice the steps to enhance positive attitude. • Observe the effects of peers on self and vice-versa.
5.	Managing emotions	• Practice the steps to manage emotional intelligence • Identify different types of emotions • Exercise control over Emotions
6.	Stress management	• Practice stress management techniques
7.	Time management	• Practice Time management techniques
8.	Interpersonal skills	• Identify positive and Negative Relations
9.	Creativity	• Lead a small group for accomplishment of a given task. • Build positive relationships.
10.	Problem solving and decision making skills	• Identify the various Problem solving and decision making skills • Make appropriate Decision
11.	Assertive and non Assertive behavior	• Practice Assertive and non Assertive behavior
12.	Leadership skills	• Exhibit Leadership skills

COURSE CONTENT

1.0 Concept of life skills

Definition of life skills, Need and impact of life skills programme

2.0 Enhancing self esteem

Concept, Characteristics of high and low self esteem people, Advantages of high self

esteem, Causes of low esteem- Identification of behavior patterns of low self esteem – Practice session of Questionnaire / Game -Steps to build a positive self esteem – Practice session of Role play

3.0 Goal setting

Significance of goal setting,Concepts of Wish, Dream, and Goal Identify Wish, Dream, and Goal and differentiate among them Reasons for not setting the goals, Barriers to reach goals,Identify Barriers Effective goal setting process & Practice Effective goal setting

4.0 Positive attitude

concept ,affects of negative attitude,attitude of self and peers,effect of peers on self and vice-versa, steps to enhance positive attitude,strategies to enhance positive attitude

5.0 Managing emotions

Problem-definition, performance problems ,Categorize the problems, barriers to the solutions to problems.

6.0 Stress management

concept of stress, Types of stress, causes of stress, reactions of stress, coping with the stress, stress relaxing techniques, changing personality and cognitive patterns

7.0 Time management

Definition, significance of various Time stealers, Time management, strategies to set priorities, steps to overcome barriers, Time-Management skills- its advantages.

8.0 Interpersonal skills

Significance of Interpersonal skills,positive relationships- Advantages, negative relationships- Disadvantages

9.0 Creativity

Definition, Invention, Innovation, Novelty,creative thinking , observation and imitation , improvement,Expertise ,skill, and motivation, components of Creativity ,Convergent thinking and divergent Thinking, various steps involved in Scientific approach to creative thinking namely , Factors affecting the creativity in Individuals, Vertical thinking and lateral thinking.

10.0 Problem solving and decision making skills

Definition, performance problems –analysis, categorizing,barriers to the solutions to problems.

11.0 Assertive and non Assertive behavior

Types of Behaviors – their characteristics, need for controlling and avoiding aggressive behaviors, making and refusing an assertive request – their evaluation, importance of goal setting, method of giving feed back.

12.0 Leadership skills

Concept , importance, Role of a Leader in an Organization, Traits of effective leader, Managing and leading, leadership styles-their Comparison, theories of leadership, strategies to develop effective leadership, importance of Decision making, concept of ethical leadership and moral development.

REFERENCES

1.Robert NLussier, Christopher F. Achua Leadership: Theory, Application, & Skill development: Theory, Application.

HYDRAULICS & PNEUMATIC LABORATORY PRACTICE

Subject Title : Hydraulics & Pneumatics Laboratory
Subject Code : ME-509
Periods/Week : 03
Periods/Semester : 45

TIME SCHEDULE - Hydraulics Lab (ME – 509 A)

S. No.	Major Components	No. of Periods
1.	Venturimeter	03
2.	Pipe Friction	03
3.	Pelton Wheel	03
4.	Kaplan turbine	03
5.	Francis turbine	03
6.	Reciprocating pump	03
7.	Centrifugal Pump	03
	Total	**21**

OBJECTIVES
Up on Completion of the Lab the student shall be able to:

1.0 Practice the determination of C_d of Venturimeter
1.1 State the practical applications of venturimeter.
1.2 Record the manometric head readings from U-tube manometer
1.3 Record the time taken for collecting discharge by varying the discharge
1.4 Calculate the areas of the pipe and throat of the given venturimeter
1.5 Calculate coefficient of discharge of venturimeter.

2.0 Practice the determination of loss of head in a given pipe
2.1 Measure the length of the given pipe
2.2 Record the manometric head readings from U-tube manometer
2.3 Record the time taken for collecting discharge by varying the discharge
2.4 Calculate the loss of head through the pipe
2.5 Calculate the friction factor

3.0 Practice the determination of Power and Efficiency of Pelton Wheel
3.1 Identify the components of Pelton wheel
3.2 Start turbine by switching on jet of water slowly
3.3 Apply load steadily
3.4 Record load, speed
3.5 Calculate power and efficiency of turbine

4.0 Practice the determination of Power and Efficiency of Kaplan Turbine
4.1 Identify the components of Kaplan Turbine

4.2 Start turbine by giving input water supply
4.3 Apply load steadily
4.4 Record load, speed
4.5 Calculate power and efficiency of turbine

5.0 Practice the determination of Power and Efficiency of Francis Turbine

5.1 Identify the components of Francis Turbine
5.2 Start turbine by switching on jet of water slowly
5.3 Apply load steadily
5.4 Record load, speed
5.5 Calculate power and efficiency of turbine

6.0 Practice the determination of output Power and Efficiency of Reciprocating Pump

6.1 Identify the components of reciprocating pump
6.2 Record the suction and delivery pressures from pressure gauges
6.3 Record the time taken for collecting the discharge
6.4 Record the energy meter readings and calculate input power
6.5 Calculate the output power
6.6 Calculate the efficiency

7.0 Practice the determination of output Power and Efficiency of Centrifugal Pump

7.1 Identify the components of centrifugal pump
7.2 Record the suction and delivery pressures from pressure gauges
7.3 Record the time taken for collecting the discharge
7.4 Record the energy meter readings and calculate input power
7.5 Calculate the output power
7.6 Calculate the efficiency

Key competencies to be achieved by the student

Exercise	Key competency expected	Max. Marks	Marks awarded
Calculation of coefficient of discharge of Venturimeter	A. Maintain constant head B. Record readings of U-tube manometer without parallax error C. Record time taken for collection of specific quantity of water D. Calculate discharge and coefficient of discharge of venturimeter E. Repeat experiment for different heads (discharge)	A. 2 B. 2 C. 2 D. 4	
Determination of pipe friction	A. Ensure flow through pipe is full to remove air bubbles B. Record time taken for collection of specific quantity of water in tank C. Calculate pipe friction using formula	A. 1 B. 2 C. 2	
Pelton wheel	A. Start turbine by switching on jet of water slowly B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine E. Plot performance curves	A. 1 B. 1 C. 2 D. 3 E. 3	
Kaplan Turbine	A. Start turbine by switching on water supply B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine E. Repeat experiment by Varying load/speed; Plot performance curves	A. 1 B. 1 C. 2 D. 3 E. 3	

Exercise	Key competency expected	Max. Marks	Marks awarded
Francis Turbine	A. Start turbine by switching on water supply B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine E. Repeat experiment by Varying load/speed; F. Plot performance curves	A. 1 B. 1 C. 2 D. 2 E. 2 F. 2 Total 10	
Reciprocating Pump	A. Maintain steady flow in suction and delivery pipes B. Record suction and delivery pressure gauge readings C. Record time for collection of specific quantity of water, electrical meter reading (input power) D. Calculate indicated power and efficiency E. Vary the head (flow) and repeat experiment	A. 1 B. 2 C. 3 D. 2 E. 2 Total 10	
Centrifugal Pump	A. Maintain steady flow in suction and delivery pipes B. Record suction and delivery pressure gauge readings C. Record time for collection of specific quantity of water, electrical meter reading D. Calculate indicated power and efficiency E. Vary the head (flow) and repeat experiment	A. 1 B. 2 C. 3 D. 2 E. 2 Total 10	

COURSE CONTENT

1. Determination of Coefficient of discharge of Venturimeter.
2. Determination of major losses in pipes due to friction.
3. Determination of B.P. and efficiency of Pelton wheel.
4. Determination of B.P. and efficiency of Kaplan turbine.
5. Determination of B.P. and efficiency of Francis turbine.
6. Determination of I.P. and overall efficiency of a reciprocating pump
7. Determination of I.P. and efficiency of the Centrifugal pump

TIME SCHEDULE - PNEUMATICS LAB (ME – 509 B)

Sl No.	Major Topics	No. of periods
1.	Introduction to Pneumatic components	03
2.	Direct control of a single-acting cylinder	03
3.	Direct control of a double-acting cylinder	03
4.	Speed control of a double-acting cylinder	03
5.	Control of a double-acting cylinder with OR logic	06
6.	Control of a double-acting cylinder with AND logic	06
	TOTAL	24

OBJECTIVES
Up on completion of the Lab the student shall be able to

1.0 Understand about the working of Pneumatic components.
- 1.1 Explain Pneumatics
- 1.2 Identify & List Symbols used in Pneumatic circuits.
- 1.3 Explain the phenomena of compressed air for transmitting power.
- 1.4 State Pascal's law.
- 1.5 List all the pneumatic applications.
- 1.6 Define Pneumatic actuator.
- 1.7 Classify the actuators.
- 1.8 Explain Linear actuators and Rotary actuators.
- 1.9 Define valve.
- 1.10 List different types of valves.
- 1.11 Explain the function of a valve.
- 1.12 Identify the components of a valve.
- 1.13 Identify about ports and positions.
- 1.14 List the Applications of valves.

2.0 Understand about the working of Direct control of a Single-acting cylinder
- 2.1 Draw the circuit diagram for actuating a single-acting cylinder.
- 2.2 Select the suitable valve.eg:3/2 valve.
- 2.3 Connect 3/2 valve to the actuator.
- 2.4 Actuate the single-acting cylinder by operating 3/2 valve.

3.0 Understand about the working of Direct control of a Double-acting cylinder
- 3.1 Draw the circuit diagram for actuating a Double-acting cylinder.
- 3.2 Select the suitable valve.eg:4/2 valve.
- 3.3 Connect 4/2 valve to the actuator.
- 3.4 Actuate the double-acting cylinder by operating 4/2 valve.

4.0 Understand about the working of Speed control of a Double-acting cylinder

4.1 Draw the pneumatic circuit for controlling the speed of double-acting cylinder

4.2 Select 4/2 or 5/2 valve and a throttle valve.

4.3 Connect 4/2 valve and throttle valve as per the circuit.

4.4 Operate the 4/2 valve and adjust the throttle valve to control the speed of double-acting cylinder

5.0 Understand about the working of Control of a Double-acting cylinder with OR LOGIC

5.1 Draw the pneumatic circuit for controlling the speed of double- acting cylinder using OR logic.

5.2 Select two 3/2 valves and a shuttle valve(OR Valve).

5.3 Connect 3/2 valves and OR valves to the double- acting cylinder as per the circuit.

5.4 Operate either one of the 3/2 valves to control the speed of double-acting cylinder.

6.0 Understand about the working of Control of a Double-acting cylinder with AND LOGIC

6.1 Draw the pneumatic circuit for controlling the speed of double-acting cylinder using AND logic.

6.2 Select two 3/2 valves and AND valve.

6.3 Connect 3/2 valves and AND valves to the double-acting cylinder as per the circuit.

6.4 Operate two valves simultaneously to control the speed of double- acting cylinder.

KEY competencies to be achieved by the student

S.No	Experiment Title	Key Competency
1.	Introduction to Pneumatics	• Identify the components of a pneumatic circuits.
2.	Direct control of a single-acting cylinder	• Select the suitable valve.eg:3/2 valve. • Connect 3/2 valve to the actuator.
3.	Direct control of a double-acting cylinder	• Select the suitable valve.eg:4/2 valve. • Connect 4/2 valve to the actuator.
4.	Speed control of a double-acting cylinder	• Select two 3/2 valves and a shuttle valve(OR Valve). • Connect 3/2 valves and OR valves to the double- acting cylinder as per the circuit.
5.	Control of a double-acting cylinder with OR logic	• Select two 3/2 valves and a shuttle valve(OR Valve). • Connect 3/2 valves and OR valves to the double- acting cylinder as per the circuit.
6.	Control of a double-acting cylinder with AND logic	• Select two 3/2 valves and AND valve. • Connect 3/2 valves and AND valves to the double- acting cylinder as per the circuit.

COURSE CONTENT

1.0 Identify the Pneumatic components and its applications.
2.0 An experiment on Direct control of a single-acting cylinder and to know the functioning of the equipment.
3.0 An experiment on Direct control of a double-acting cylinder and to know the functioning of the equipment.
4.0 An experiment on Speed control of a double-acting cylinder and to know the functioning of the equipment.
5.0 An experiment on controlling the speed of a double-acting cylinder with OR logic and to know the functioning of the equipment.
6.0 An experiment Control speed of a double-acting cylinder with AND logic and to know the functioning of the equipment.

REFERENCE BOOKS

1. Course Material on Basic Pneumatic Controls- ATI, Vidyanager, Hyderabad
2. Course Material on Applications of Pneumatics- TTTI, Extension centre, Hyderabad(NITTTR-ECH)

FIELD PRACTICES

Subject Title	**:**	**Field Practices**
Subject Code	**:**	**ME – 510**
Periods Per Week	**:**	**06**
Periods Per Semester	**:**	**90**

TIME SCHEDULE

1. Production

Project	Skill Exercise	Number of Periods
Measuring sizes with a vernier caliper	• Measure the outside diameter, Inside diameter of a bore • Measure the width of a tongue • Measure the length of a step • Measure the depth of a stepped bore	04
Filing practice	• File the of Drill base of 151x101x6 on all sides to remove material 1 mm	04
Drilling practice	• Drill through holes of 4XØ6 (@ 6,6) from all the corners of the Drill base of 150x100x5 (Repeat the same procedure for Drill Guide)	04
The above practices can be exercised by considering similar components fulfilling the above requirements		
Gear hobbing	• Perform gear hobbing on a given MS job with OD Ø74, ID Ø17 and thickness 10mm, Take 1 module as teeth thickness (or) Performing spur gear cutting on a given MS job with OD Ø74, ID Ø17 and thickness 10mm, Take 1 module	06
Manufacture of solid shaft	• Turn and face the given cylindrical rod according to the dimensions • Cut the key way on the above shaft for the flat key • Make the seat to mount the bearing on the above shaft	04
Cutting splines on the shaft	• Turn and face the given cylindrical rod according to the dimensions • Index the job using dividing head • Cut the splines on the above shaft on milling machine	04
Cutting straight teeth on the gear blank	• Index the job using dividing head • Cut the teeth on the gear blank on milling machine	04

1. Production (contd,.....

Project	Skill Exercise	Number of Periods
Manufacturing of square threaded screw	• Turn and face the given cylindrical rod according to the dimensions • Cut the square threads on the rod for given pitch using back gear of the lathe	04
Preparing template for involute gear tooth	• Understand the law of gearing • Understand the properties and importance of involute profile	04
Casting of flange coupling	• Prepare the pattern • Prepare the mould and core for the flange coupling • Drill the holes on the casted flange • Cut the key way in the hub of flange	04

2. Fabrication

Project	Skill Exercise	Number of Periods
Fabrication of Almirahs and trunk boxes	• Measure the gauge of the sheet with gauge plate • Produce marking on sheet • Cut the sheet as per marking • Bend , weld the sheets • Apply primer and paint	04
Critical cases	• List out the sequencing of job planning when you have received a oversized component	04
Practically with the support of the process sheet proforma adopted. Eg:1.Supporting of heavy weight job by using Jigs & Fixtures 2.If the dia.of the rod is more while testing on a UTM the suitable jaws will be replaced for holding		

3. Servicing

Project	Skill Exercise	Number of Periods
Repair and Maintenance of	• Engines Eg:Differential,Gear box & M/c parts & its components,etc	04
	• Refrigeration and Air conditioning test rigs Eg:Evacuating & charging of the Refrigerant,etc	04
	• Pumps Eg:Inlet & outlet valves,foot valve,gland of a pump,etc.	04
The viist may arranged to the following: • Tyre servicing centers • Servicing and maintenance of Automobiles • Refrigeration system in dairies • Thermal power plants • Workshops (RTC)		

4. Human Resource management

Project	Skill Exercise	Number of Periods
Manpower requirement	• Planning and Assessing man power Student will be guided to prepare the man power requirement in the laboratories by assessing the demand. Eg:Boring of a component with an authorised process sheet,etc Skilled technician-1,Store keeper-1,Transport Asst.-1,Helper-1	06

5. Inventory management

Project	Skill Exercise	Number of Periods
Material requirement	• Handle the Store House and its transactions • Select the Appropriate Storehouse Equipment • Use Appropriate methods to Preserve the Store house material • Practice Replenishment of material • Practice Identification of store materials • Maintain Appropriate Records in Store Accounting • Use Material Budgeting Techniques • Use Techniques of Inventory control • Practice Purchasing and Disposal procedures • Use Quality control and Value Analysis • Practice Negotiation procedures • Use Transportation and Disposal procedures	08
Note: The student has to identify the material requirement in his field of working and should have knowledge on purchasing, store maintenance and disposal of unserviceable & outdated components & equipment.		

6. Case studies

Project	Skill Exercise	Number of Periods
Conduct energy audit for workshop/Home/SSI unit	• Collect information about energy utilization in a local industry. Identify energy saving measures (to be) taken up in the industry	04
Note: The viist may arranged to appropriate industry to collect the information		

6. Safety

Project	Skill Exercise	Number of Periods
Mock drill	• Rescue the persons from crash • Rescue the persons from Fire accident	06
Eg:Fire Accident • Knowledge & practice on fire extinguishers • Using of sand buckets • Informing to the fire fighting agency.		
First Aid	• Practice the First aid procedures	04
Eg:Hitting of a shaper ram • Cleaning the injured area with spirit • Applying betadin over injury • Temporary bandage over the injury • Moving person to nearest hospital • Artificial Respiration incase of electrical shock,etc		

SKILLS

Up on completion of the skill session the student shall be able to

1.0 Measure the outside and inside diameters of a bore

- Check the condition of the caliper
  - Confirm the looseness of the locking screw
  - Clean every part of the caliper with rags
  - Close the jaws, and examine the opening through light
  - Check whether the zero points coincide

Measure Outside diameter:

- Open out the movable jaw slightly more than the measurable size
- Place the jaws at right angles to the axis of the work piece
- Close the jaw over the work piece such that the nib of the jaws just slip from the point of contact
- Lock the nib and record the reading

Measure Inside diameter:

- Open out the ribs of the vernier caliper slightly less than the measurable size.
- Place the nibs inside the bore surface such that the nibs are parallel to the axis of the work piece and centre of the bore
- Open out the nibs so as to make contact on the bore surfaces, and swing the nibs to measure the maximum value of the bore size
- Lock the nib and record the reading

2.0 File the of Drill base of 151x101x6 on all sides to remove material 0.5 mm

- Wear the apron
- Check the raw material (Drill base) size as per the work sheet (151x101x6)
- Select the suitable height of the vice
- Clamp the work piece centrally across the base firmly in position
- File surfaces flat and parallel to an accuracy of ±0.05 mm
- File angle to **90^0** to a try-square accuracy
- Check for flatness and squareness using tri-square
- Measure the specifications of job is to be 150x100x5

3.0 Drill through holes of 4XØ6 (@ 6,6) from all the corners of the Drill base of 150x100x5

- Wear the apron
- Follow safety and procedural precautions
- Check the Drill base for its size
- Mark and locate the centres for the holes to be drilled
- Mount the job in a machine vice, using parallels and clamp it securely
- Set the work table in such a manner that the drill can be fixed and removed without disturbing the vice or table
- Fix a centre drill on the chuck in a drilling machine spindle and align with the centre mark on the job
- Spot the hole location with the centre drill
- Remove the centre drill and fix the required drill of Ø6 without disturbing the vice or table
- Perform an operation of drilling a hole of a diameter of Ø6 up to a depth of 1mm for first go
- Operate a coolant pump
- Drill through hole as per requirement

4.0 Perform gear hobbing on a given MS job with OD-Ø74, ID-Ø17 and Thickness 10mm, Take 1 module as teeth thickness

- Wear the apron
- Check the raw material specifications OD-Ø74, ID-Ø17 and thickness 10mm size as per the work sheet
- Fix the job on appropriate mandrel using watchers and ensure that the one side of mandrel to be fitted in the cullet of the Miller and another side should be tightened using nut
- Fix the 1 module cutter(Gear hobber) specified as $0^0.8^1$ $M20^0$ LA , 0^0 57^1 80^0 PA
- Set the index table to suit the cutter specifications
- Set the feed as 0.15 mm / rev as per the Gear train chart
- Set the speed as 624 m/min for the material MS EN8 as per the speed chart
- Switch on the machine to perform the operation i.e Gear hobbing
- Ensure that the operation is completed in 08 min
- Take care of safety and procedural precautions
- Remove the chips from the job

- Clean the machine
- Remove the job with mandrel from machine cullet

5. Understand the Material Requirement plan (Note**:** The faculty in charge needs to plan appropriate situation to accomplish the given exercises)

- **Handle the Store House and its transactions**
  1. Draw a typical layout of storeroom considering
     a) Optimum utilization of space
     b) Easier accessibility to all materials
     c) Maximum security of all materials
     d) Minimization of spoilage and damage
  2. Select appropriate Store depot based on their function and utility
     a) For minimum possible stocks of spares, Equipments, Tools
     b) If regular supplies are received, Un-necessary hold- ups and delays in work are avoided
        - CSD – Central Store Depot
        - BSD – Branch Store Depot
        - TSD – Tool Store Depot
- **Select the Appropriate Storehouse Equipment**
  1. Identify storeroom equipment for a given materials
  2. Group the articles according to their nature of storage
  3. Arrange appropriate racks to store various materials like Bar, Tubes, Angles, Plate, Sheet, Tyre and Drum
  4. Use Various measuring equipment to receive the different types of material
  5. Which type of material handling equipment do you select, If you are given the following materials
     a) Bricks
     b) Reels of wire
     c) Drums
     d) Bales of paper
  6. Which type of material handling equipment do you select to lift the machines of 2 to 6 tonnes up to the height of 40 feet

- **Use Appropriate methods to Preserve the Store house material**
  1. Preserve the following material according to the manufacturing criteria, degree of temperature and duration
     1. Metals
     2. Timber
     3. Textiles
     4. Rubber goods
     5. Chemicals
     6. Leather goods
  2. Maintain Replenishment of stock by fixing
     a) Maximum level
     b) Minimum level
     c) Order level
     d) Danger level

- **Practice Replenishment of material**
  Represent graphically the Working stock and Safety stock in Replenishment of material

- **Practice Identification of stores**
  1. Classify and Use Identification system for a given Raw material, Consumables, Machines and Equipment, Inflammable stores, Chemicals, Furniture, General stores, Scrap materials, Packaging materials, Fuel stock

- **Maintain Appropriate Documents in Store Accounting**
  1. Prepare the Documents for recording of **Receipt of material**
     a) Material Receipt book
     b) Material Receipt Note
     c) Daily Receipt Voucher
     d) Damage/Shortage/Excess Report
     e) Package slip
     f) Bin Card
     g) Stock Ledger
     h) Stock Identification Card
  2. Prepare the Documents for recording of **Inspection of material**
     a) Purchase order
     b) Daily Receipt Voucher
     c) Inspection Note
     d) Rejection Note
     e) Bin Card
     f) Stock Ledger
     g) Stock Identification Card
  3. Prepare the Documents for recording of **Issue of material**
     a) Material Requisition Slip
     b) Bin Card
     c) Gate pass
     d) Stock Ledger
     e) Stores Advice Note
  4. Prepare the Documents for recording of **Verification of Stores**
     a) Stock- Taking Sheet
     b) Stock Valuation Sheet
     c) Bin Card
     d) Material Transfer Note
     e) Material Return Note
     f) Stock Ledger
  5. Prepare the Documents for recording of **Material Control**
     a) Stock Day sheet
     b) Stock Ledger Card
     c) Kardex Card

- **Use Material Budgeting Techniques**
  1. Practice the Estimation of Consumption and Purchase of materials of a given Organization

2. Use the Techniques for Drawing up a Material Budget of a given Organization.

- **Use Tools and Techniques of Inventory control**
  1. Practicing of Estimation of Consumption and Purchase of materials of a given Organization
  2. Use the Techniques for Drawing up a Material Budget of a given
- **Use Tools and Techniques of Inventory control**

1. Practice the Estimation of Inventory carrying cost, Stock-out Cost and Control levels of a given Organization.
2. Use the Tools and Techniques of Inventory control
3. Prepare the Stock Control Card

- **Practice Purchasing and Disposal procedures**

1. Practicing the purchasing principles of six 'R's.
   a) Right Quality
   b) Right Quantity
   c) Right Time
   d) Right Price
   e) Right place, and
   f) Right Source
2. Use the Various Order Quantities in purchasing and Disposal
3. Practicing the use of purchasing systems considering legal aspects of purchasing
4. Practicing the use of the following documents in purchase procedure
   a) Purchase Requisition
   b) Purchase Enquiry
   c) Suppliers Quotation
   d) Comparative statement
   e) Purchase Order
      Bill / Invoice

- **Use Quality control and Value Analysis**

1. Practicing the use of the following Methods of describing quality of the product
   a) Samples
   b) Brand name
   c) Specifications
   d) Grades
2. Use the Five stages of Quality control for an effective accomplishment of Onerous task
3. Practicing the use of Techniques of Value Analysis in reducing the product cost
   a) EKCHANGE, and
   b) MISS

- **Practice Negotiation procedures**
  1. Practice the Phases of Negotiation

  [Note: Arrange a practicing session between two parties]

- **Use Transportation and Disposal procedures**

  1. Practicing the following tasks to be carried out for effective transportation of goods of an enterprise

  Estimation of

  a) Cost of transportation
  b) Commodity value
  c) Size of Shipment
  d) Distance control
  e) Type of Transport
  f) Speed

  2. Practicing the appropriate Disposal procedures

  a) Surplus Items
  b) Obsolete Items
  c) Scrap Items

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI Semester/(THIRD YEAR)

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
ME-601	Entrepreneurship and Project Management	4	-	60	3			100
ME-602	Refrigeration & Air Conditioning	5	-	75	3			100
ME-603	Energy Sources & Power Plant Engineering	4	-	60	3			100
ME-604	CAM	3	-	45	3			100
ME-605	Measurement & Control Systems	5	-	75	3			100
ME-606	Automobile Engineering	4	-	60	3			100
PRACTICAL:								
ME-607	CAM Lab	-	4	60	3			100
ME-608	T.E and R & AC Lab Practice	-	3	45	3			100
ME-609	Manufacturing &Servicing and Maintenance Lab Practice	-	3	45	3			100
ME-610	Project work	-	7	105	3			100
	TOTAL	25	17	630				1000

ENTREPRENEURSHIP AND PROJECT MANAGEMENT

Subject Title : Entrepreneurship and Project Management
Subject Code : M–601
Periods/Week : 04
Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	Periods	Weightage Of Marks	Short Answer Questions	Essay Type Questions
1.	Role of Entrepreneur and Entrepreneurial Development	12	26	02	02
2.	Marketing ,Sales & Feasibility study	12	26	02	02
3.	Industrial legislation & safety	18	29	03	02
.4	Introduction to ISO 9000 & T.Q.M.	18	29	03	02
Total		60	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the role of entrepreneur in economic development and in improving the quality of life.

1.1 Explain the concepts of Entrepreneurship.
1.2 Define the word entrepreneur.
1.3 Explain the role of Entrepreneurship.
1.4 List the qualities of an entrepreneur.
1.5 Explain the requirements of an entrepreneur.
1.6 Outline the expectations of Entrepreneurship.
1.7 Explain the role of entrepreneurs in promoting Small Scale Industries.
1.8 Explain the details of self-employment schemes.
1.9 Explain the method of product selection.
1.10 Explain the method of site selection.
1.11 Outline the method of plant layout.
1.12 State the needs for a planned and co-ordinated effort.
1.13 State the importance of follow up.
1.14 Describe the small business scheme.
1.15 List the financial assistance programmes.
1.16 List the organisations that help an entrepreneur.

2.0 Understand marketing, sales and feasibility study.

2.1 Explain marketing functions.
2.2 Explain Sales function.
2.3 List out market conditions
2.4 Differentiate Sellers and Buyers' market.
2.5 Differentiate monopoly, oligarchy, and perfect competition.
2.6 Explain the conduct of demand surveys
2.7 Explain the conduct of a market survey
2.8 Differentiate product and production analysis.
2.9 List the input materials, i.e. Bill of materials

2.10 Define the main policy requirements
2.11 Explain the selection of site
2.12 Evaluate Economic and Technical factors
2.13 Prepare feasibility study
2.14 List different products currently in demand with market or industry
2.15 Explain Role of advertising, media of advertising and selection of media

3.0 Comprehend the provisions of industrial legislation in India. & Safety procedures

3.1 Describe employer and employee relations.
3.2 Describe the mechanics of Trade Unions.
3.3 Describe mechanics of settlement of in outs.
3.4 Explain the significance of collective bargain.
3.5 List Welfare activities.
3.6 List subsidy schemes.
3.7 Explain the total welfare concept.
3.8 List the rights and responsibilities of employees and employers.
3.9 List the salient features of Indian Factories Act.
3.10 List the salient features of Minimum Wages Act.
3.11 List the salient features of Industrial Disputes Act.
3.12 List the salient features of Workmen's Compensation Act
3.13 List the salient features of E. S .I. Act.
3.14 List the salient features of consumer protection rights Act
3.15 Explain the importance of safety at Work place.
3.16 Explain the significance and mechanics of safety education.
3.17 Explain hazard and accident
3.18 List different hazards in the Industry
3.19 Explain the causes of accidents
3.20 Explain the direct and indirect cost of accidents.
3.21 List types of fire extinguishers
3.22 Describe the method of artificial Respiration.
3.23 List provisions of Indian Electricity Rules laid in the electricity act1923.

4.0 Understand ISO 9000 & TQM.

4.1 Explain the concept of quality.
4.2 List the quality systems and elements of quality systems.
4.3 State the principles of quality Assurance.
4.4 State the Indian Standards on quality systems.
4.5 List the evolution of ISO standards.
4.6 Explain ISO standards and ISO 9000 series of quality systems.
4.7 State the constituents of ISO 9000 series of standards for quality systems.
4.8 State the outstanding features and drawbacks of ISO 9000 series of standards.
4.9 List the beneficiaries of ISO 9000.
4.10 Explain 5-S principles and ZERO DEFECT.

COURSE CONTENT

1. **Role of Entrepreneur & Entrepreneurial Development.**
   Materials in industry, inventory control model, ABC Analysis, Safety stock, re-order, level, Economic ordering quantity, Cost Elements of Cost, Contribution, Break even analysis, Stores layout, stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, Hoist, Cranes, conveyors, trucks, fork trucks.

2. **Marketing, Sales & Feasibility Study**
   Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligarchy, perfect competition, Budgets, Pricing Policies. Market Survey, Product and production Analysis, Materials input, Manpower, Location, Economic and Technical Evaluation, preparation of Feasibility study reports, - different products – Mechanical, Electrical, Electronics, consumer items, Consumer desires etc.

3. **Industrial Legislation and safety**
   Employer – Employee relations, Trade, Union Settlement of disputes, collective bargaining, Welfare activities, subsidies, Total Welfare concept, rights and responsibilities and Employers and employees. Salient features of (i) Indian Factories Act, (ii) Minimum Wages Act, (iii) Industrial Disputes Act, (iv) Workmen's compensation Act, (v) E.S.I Act. (Vi) Consumer protection act Important of Safety at work places, Safety Education, Hazards, causes of accidents, Cost of accidents, Fire Extinguishers, Artificial respiration, Indian Electricity rules.

4. **Introduction to ISO 9000 and TQM**
   Concept of quality discussed by B. Crosby W. Edward, Deming, Joseph M. Juran, Kooru Ishikawa, Genichi Taguchi, Shigco Shingo.Quality systems –
   Definitions of the terms used in quality systems like, quality policy, quality management, quality systems, quality control and quality assurance
   Elements quality systems : Management responsibility, Quality system, contract review, design control, document control, purchasing, purchaser – supplied product, product identification and traceability, process control, Inspection and testing. Principles of quality assurance – Definition of quality assurance.
   Indian standards on quality systems – Main features of IS 13999 : 1990, IS 14000 : 1990, IS 14004 : 1990, IS 14001: 1990, IS 14002 : 1990, IS 14003: 1990. The necessity of International standards – Evolution of ISO. **5-S** principles – importance – meaning – approach – benefits
   Various standards under ISO – Outstanding features of ISO 9000 series of standards – ISO 9000 Phenomenon ISO 9000 series of quality systems – Constituents of ISO 9000 series of standards for quality systems.
   Drawbacks of ISO 9000 series of standards, list the beneficiaries of ISO 9000

REFERENCE BOOKS

1. Industrial Engineering and Management -by O.P Khanna
2. Production Management- by Buffa.
3. Engineering Economics and Management Science - by Banga & Sharma.
4. S.S.I Hand Book by S.B.P. Publishers.
5. Personnel Management by Flippo.
6. Entrepreneurship – by NITTT&R, Chennai.
7. Industrial safety management- by Deshmukh (MGH Publishers)

REFRIGERATION AND AIR CONDITIONING

Subject Title : Refrigeration & Air conditioning
Subject Code : M-602
Periods/Week : 05
Periods per Semester : 75

TIME SCHEDULE

Sl. No.	Major Topics	No. of Periods	Weightage	Short	Essay
1.	Fundamentals of Refrigeration & Air Refrigeration	10	13	01	01
2.	Vapour compression & Vapour absorption Refrigeration Systems	18	26	02	02
3.	Refrigerants, Refrigeration equipment & Applications	16	26	02	02
4.	Fundamentals of A/c & A/c Equipment	08	13	01	01
5.	Psychrometry, Cooling & Heating loads	14	19	03	01
6.	Applications of A/c, Servicing and maintenance of Refrigeration and A/c equipment	09	13	01	01
Total		**75**	**110**	**10**	**08**

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the various methods of Refrigeration.

1.1 Define refrigeration.
1.2 Explain the history of refrigeration.
1.3 Explain different methods of refrigeration such as ice, dry, ice, steam jet water refrigeration, liquid nitrogen refrigeration.
1.4 Express unit of refrigeration in Terms of ton of refrigeration.
1.5 Define coefficient of Performance.
1.6 Evaluate power required per ton of refrigeration.
1.7 Explain the principle of open air refrigeration.
1.8 Analyse Carnot refrigeration Cycle.
1.9 Analyse Bell-Coleman air-cycle.
1.10 Calculate COP in above cases.
1.11 Explain principle of closed air Refrigeration.
1.12 Distinguish between open air system with closed air system.

2.0 Understand Vapour Compression, and Vapour absorption Refrigeration Systems.

2.1 Explain the importance of vapour compression system.
2.2 Explain vapour compression refrigeration with the help of T-S and P-H diagrams.
2.3 Distinguish between wet and dry compression.
2.4 Explain the effects of under cooling and super heating and effect of pressure changes on COP.

2.5 State the use of flash chamber and accumulator.
2.6 Calculate COP of plant working on vapour compression system.
2.7 Explain principle of simple vapour absorption systems.
2.8 List refrigerant – Absorber pairs in the above system.
2.9 State the desirable properties of refrigerants absorbers.
2.10 Describe the working principle of vapour absorption refrigeration system with the help of a legible sketch.
2.11 Calculate "COP" of the ideal vapour absorption system.
2.12 Differentiate two fluid system and three fluid absorption system.
2.13 Explain working of solar powered refrigeration system with the help of a legible sketch.
2.14 Explain the working of Electrolux refrigeration with the help of a legible sketch.
2.15 Explain the working of Lithium Bromide absorption refrigeration system with the help of a legible sketch.

3.0 Understand the Refrigerants, Refrigeration Equipment and applications of Refrigeration

3.1 Distinguish between primary and secondary refrigerants.
3.2 State the requirements of Refrigerants.
3.3 List the properties of refrigerants.
3.4 List the commonly used refrigerants.
3.5 Explain different types of compressors such as reciprocating and rotary
3.6 State the function of condenser and classify the condensers
3.7 Explain different types of condensers such as shell & tube, shell and coil, fin and tube, flooded tube type with the help of a legible sketch..
3.8 State the function of evaporator and classify the evaporators
3.9 Explain various types of evaporators such as shell & tube, shell and coil, fin and tube, flooded tube type with the help of a legible sketch.
3.10 Explain the functions of various types of expansion devices such as capillary tube, thermostatic expansion valves and solenoid valves with the help of a legible sketch.
3.11 Explain the refill type and throw away type dryers.
3.12 Explain the working of domestic refrigerator with the help of a legible sketch.
3.12 Explain the working of ice Plant with the help of a legible sketch.
3.13 Explain the working of water cooler with the help of a legible sketch.
3.14 Explain the working of cold storage with the help of a legible sketch.
3.15 Explain the production of dry ice with the help of a legible sketch.

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4.0 Understand fundamentals of Air conditioning and Air conditioning equipment

4.1 Define air conditioning
4.2 List modern applications of A/c.
4.3 Explain Air conditioning as applied to human comfort.
4.4 Explain the functions of fans, ducts, filters (wet, dry, electric & viscous types) C.F dust collector with the help of a legible sketches.

4.5 Explain the use of heating and cooling coils.
4.6 Explain the air distribution system.

5.0 Understand Psychrometry, Cooling and Heating loads.

5.1 Define the terms humidity, Relative humidity, dew point, DBT & WBT, Absolute humidity, humidity ratio.
5.2 Explain the features of psychrometric chart.
5.3 Plot psychometric processes on the above chart.
5.4 Explain the psychrometric patterns for heating and cooling processes.
5.5 Define Fundamentals of Heat transfer – Conduction, convection and Radiation.
5.6 Compute cooling load – components involved in cooling load.
5.7 Compute heating load – components involved in heating load.
(Problems on load calculations are Omitted)

6.0 Appreciate the applications of A/C.

6.1 Explain the working of air coolers.
6.2 Explain the working of window air – conditioner.
6.3 Explain the working of cooling tower installations.
6.4 Explain the working of A/c systems viz., centralised and unitary systems.
6.5 Explain the working of summer/winter/year round air conditioners.
6.6 Explain the symptoms of gas shortage.
6.7 Explain the methods of leakage detection.
6.8 List the causes of common Breakdown.
6.9 List the remedial measures for breakdown.

COURSE CONTENT

REFRIGERATION

1.0 Fundamentals of Refrigeration and Air Refrigeration

Introduction – Definition and meaning of refrigeration, methods of refrigeration – unit of refrigeration – COP.
Thermodynamic analysis of Refrigeration cycles, Carnot refrigeration cycle – Air refrigeration cycle (Bell – Coloman) open air and closed air systems of refrigeration.

2.0 Vapour Compression and absorption Refrigeration Systems.

Principle & analysis of vapour compression refrigeration system with the help of T-S & P-H diagrams – wet, dry and superheated compression – Refrigerating effect – Effect of pressure changes on C.O.P., effect of sub – cooling of condense on COP and capacity – effect of super heating of vapour before compression – flash chamber and accumulator.
Principle of vapour absorption refrigeration, C.O.P of vapour absorption system - Refrigerants and absorbents – their properties – two fluid & three fluid systems – solar powered refrigeration system - Electrolux refrigeration – comparison of vapour absorption and vapour compression systems.

3.0 Refrigerants, Refrigeration Equipment and applications

Primary and secondary refrigerants with examples – requirements of a refrigerant – properties of refrigerants – Commonly used refrigerants

Compressors – types of compressors.Condensers – types of condensers.
Evaporators – types of evaporators.Expansion devices – types of expansion devices – Refill type and throw away type driers.
Domestic refrigerator – ice plant, Water cooler – cold storage – production of dry ice.

AIR CONDITIONING

4.0 Fundamentals of A/c and A/c equipment

Comfort air conditioning: Human comfort – effective temperature – Factors governing effective temperature conditions that effect body heat – comfort chart.
A/C Cycle equipment such as fans, supply ducts, outlets, return outlets and ducts, filters & dust collectors heating/cooling coil-Air distribution.

5.0 Psychrometry, Cooling and Heating

Psychrometry – Psychrometric terms – Psychrometric chart – Solving problems with psychrometric chart – Practical applications of psychrometric terms – Psychrometric processes. Psychrometric patterns for heating & cooling processes.
Conduction, convection and Radiation definitions - Heating and cooling load .

6.0 Applications of A/C, Servicing and maintenance of Refrigeration and A/c equipment

Applications of A/C: Air coolers – window air conditioner – (split & package type) – cooling towers – A/C systems: summer/winter/year round A/C, central A/C system – unitary system.
Food preservation – freeze drying.
Servicing & Maintenance of Refrigeration and A/c Equipment – trouble shooting.

REFERENCE BOOKS

1. Refrigeration and Air Conditioning – by Domakundavar
2. Refrigeration and Air Conditioning – by Arora (MGH Publishers)
3. Basic Refrigeration and Air conditioning - by P N Ananthanarayana (MGH Publishers)
4. Refrigeration and Air Conditioning – by Sarao & Gabi
5. Refrigeration and Air Conditioning – by Dosatt
6. Refrigeration and Air Conditioning – by Stoecker
7. Trouble shooting of Refrigeration & -by Ananthanarayana Air conditioning

ENERGY SOURCES AND POWER PLANT ENGINEERING

Subject Title : **Energy Sources and Power Plant Engineering**
Subject Code : **M-603**
Periods/Week : **04**
Periods/Semester : **60**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Introduction of Renewal Sources of Energy	04	03	01	-
2	Solar and Wind Energy	12	26	02	02
3	Fuel Cells and MHD Generator	10	13	01	01
4	Bio and Tidal Energy	12	26	02	02
5	Thermal and Nuclear Power Plants	16	29	03	02
6	Environmental Pollution	06	13	01	01
	Total	**60**	**110**	**10**	**08**

OBJECTIVES

Up on the completion of the course the student shall be able to

1.0 Understand the need of Energy Sources

1.1 State various energy sources, give examples
1.2 Classify energy sources as renewable and non renewable energy
1.3 State Advantages and disadvantages of renewable and non renewable energy sources
1.4 Appreciate the need of renewable energy sources
1.5 State the different types of renewable energy sources

2.0 Understand the concept of Solar and Wind Energy

2.1 State the amount of solar radiation reaching the earth's surface
2.2 Determine the solar constant
2.3 State the principle of measuring solar radiation by pyranometer and pryheliometer
2.4 State the principle of conversion of solar radiation into heat.
2.5 Explain the function of liquid flat collector
2.6 Explain the working principle of solar air heater with a legible sketch
2.7 State the applications of solar air heater
2.8 Identify different types of concentrating collectors
2.9 Explain the working principle of concentrating collector (focusing type, parabolic trough collector and flat plate collectors with plain reflectors).

2.10 State the different methods of storing solar energy
2.11 Explain the methods of sensible heat, latent heat and thermo chemical storage.
2.12 Explain the working principle of solar pond with a sketch
2.13 State the applications of solar pond
2.14 Explain with the help of sketch the construction details and working principle of different types of solar water heater
2.15 Explain with the help of sketch the construction details and working principle of solar space heater
2.16 Explain with the help of sketch the construction details and working principle of absorption refrigerator type solar space cooler
2.17 Explain with the help of sketch the construction details and working principle of solar still
2.18 Explain with the help of sketch the construction details and working principle of cabinet and connective type of solar drier
2.19 Explain with the help of sketch the construction details and working principle of Box type solar cooker
2.20 State the principle of photo –voltaic conversion.
2.21 State the working principle of solar cell
2.22 Explain the conversion energy and current voltage characteristics of solar cell.
2.23 State the use of photo voltaic cell for power generation
2.24 Explain the solar photovoltaic arrays
2.25 Explain the solar water pumping system with a sketch
2.26 State the advantages and limitations of solar energy conversion.
2.27 Explain the power available in the wind and force caused by it on the blades.
2.28 State the collection of wind data and estimate the energy
2.29 State the different considerations for sight selection for installing wind mill.
2.30 Identify the basic components of a wind mill
2.31 Explain the construction details on the working principle of the wind mill
2.32 State the differences between horizontal axis and vertical axis type wind mills
2.33 Define the terms co-efficient of performance and tip speed ratio
2.34 Plot curves to indicate the variation of co - efficient of performance with tip speed ratio.
2.35 Explain the method of generation of electricity by wind mill

3.0 Comprehend Fuel Cells and MHD Generator

3.1 State the working principle of fuel cell
3.2 Explain the construction details and working principle of Bacan's High pressure fuel cell with a legible sketch
3.3 State the different types of fuels used in fuel cells
3.4 Explain the working principle of aluminium air fuel cell with a legible sketch
3.5 Explain the working principle of MHD Generator a legible sketch

4.0 Understand Bio and Tidal Energy

4.1 Define the meaning of bio-mass and bio-gas
4.2 State the principle of bio-gas generation
4.3 State the chemical composition and properties of bio-gas
4.4 List the applications of bio-gas

4.5 List the different types of bio-gas plants
4.6 Explain the construction details and working principle of fixed dome type and floating dome type bio-gas plants with sketches
4.7 State the different materials used for bio-gas generation
4.8 Express bio-gas plant capacity
4.9 State the methods of generator control and load control
4.10 Identify the energy available in tides and its usefulness in conversion
4.11 State the working principle of tidal power plant
4.12 State the different operation methods of utilisation of tidal energy
4.13 Explain single basin and double basin arrangements
4.14 State the site requirements for installation of tidal power plant
4.15 State the advantages and limitations of tidal power generation

5.0 Analyse the elements of Thermal and Nuclear Power Plants.

5.1 Draw the layout of a thermal power plant.
5.2 Explain the layout of thermal power plant
5.3 Locate the Boiler, superheater, turbine , Electric Generator, Condenser and hot well pump in the layout.
5.4 Explain function of circulating water pump, Economiser, Air pre heater, Soot – Blower.
5.5 Explain the dust extraction in Electrostatic precipitator.
5.6 Explain about the ash removal, water cooling.
5.7 Explain about the feed water treatment.
5.8 Explain about the coal handling
5.9 Explain about the coal storage.
5.10 Identify the fuel handling equipment.
5.11 Trace the ash disposal system.
5.12 State the necessity of condensing the steam
5.13 State the principle of condensation in condenser
5.14 List different types of condensers
5.15 Explain the chain reaction
5.16 Explain the process of nuclear fission and nuclear fusion.
5.17 List nuclear fuels
5.18 State the characteristics of atomic power plants
5.19 Explain the principle of working of a nuclear reactor
5.20 Classify the nuclear reactors
5.21 Explain with the help of legible sketch the constructional details and the working principle of : (i) PWR (ii) BWR power plant.
5.22 Explain with the help of legible sketch the constructional details and the working principle of: (i) GCR (ii) Liquid metal - C.R. Power plant.
5.23 Explain about the nuclear power in India.

6.0 Understand the concept of environmental pollution

6.1 Explain the various pollutants and their effect on the environment viz.,
i) Particulate pollutants.
ii) Solid waste pollutants.
iii) Gaseous pollutants.
6.2 Explain the effect of thermal pollution
6.3 Explain green house gases and green house effect
6.4 Explain the phenomena of global warming

6.5 Explain the effects of nuclear radiation
6.6 Explain the disposal of nuclear waste
(i) Ground (ii) Air (iii) Ocean

COURSE CONTENT

1.0 Introduction: Various energy sources, Examples for energy sources, advantages and disadvantages, Need for alternate sources of energy – types of non conventional (renewable) energy sources – solar energy, wind energy, energy from bio- mass and bio-gas, tidal and wave energy, hydrogen energy, fuel cells

2.0 Solar and Wind Energy

Solar Radiation: Solar constant – solar radiation at earth's surface – instruments for measuring solar radiation – pyranometer, pryheliometer.

Solar Energy Collection

Principle of conversion of solar radiation into heat
liquid flat collectors - solar air heater – Application of solar air heater – concentrating collectors – (focusing type) – parabolic collector –plate collectors with plane reflectors.

Solar Energy Storage

Methods of storing solar energy – sensible heat storage , latent heat storage and thermo chemical storage – solar pond – working principle and description of solar pond with a schematic diagram – applications of solar pond.

Solar Energy Applications

i) Solar water heater – natural circulation type and forced circulation type.
ii) Solar space heater – passive type and active type
iii) Solar space cooling – absorptive refrigeration system
iv) Solar still, Solar drier – cabinet type and convective type and Solar cooker

Photo voltaic conversion

solar cell – working principle – conversion efficiency and current voltagecharacteristics of a solar cell – photo voltaic cell for power generation solar photo voltaic arrays – solar water pumping system – Advantages and disadvantages of solar energy.

Wind Energy

Introduction – power in the wind forces on the blades – wind data – energy estimation – site selection considerations – basic components of a wind mill – construction details and working principles – types of wind mill – horizontal axis type and vertical axis type – variation of co efficient of performance with tip speed ratio – electric generation by wind mill – generator control – load control.

3.0 Fuel Cells and MHD Generator

working principle – Bacan's High pressure fuel cell – construction details and working principle – types of fuels used – Aluminium – air fuel cell working principle. working principle of MHD Generator

4.0 Bio and Tidal Energy

Bio Energy – Introduction to bio – mass bio-mass conversion into energy bio-gas generation – composition and properties of bio-gas – applications of bio-gas. Classification of bio-gas plants – continuous and batch type, the dome and drum type, floating gas holder and fixed dome type – construction details and working principle of fixed dome type and floating gas holder type bio – gas plants – materials used for bio-gas generation – capacity of bio-gas plant – starting of bio-gas plant.

Tidal Energy : Introduction to tidal power – components of tidal power plants – operation methods and utilisation of tidal energy – single basin and double basin arrangements- site requirements – advantages and limitations of tidal power generation.

5.0 Steam and Nuclear Power Plant

Steam Power Plant

Layout of a Thermal Power Plant, Choice of site, explanation of important elements in layouts:- Such as Boiler, Condenser , Feed water system, Circulating water pumps ,Economiser, Air heater, Soot–Blower , Forced draught Fan, Dust collectors, Electro static precipitator

Supporting activities:- Such as Water cooling, Feed water treatment, Coal handling, Coal storage , Chimney.

Description of fuel handling equipment, unloading equipment, preparing equipment, modern ash handling equipment, dust collection and disposal , roots blower, condensers, principles classification – comparison – condensers and vacuum efficiencies and simple problems.

Nuclear – Power Plants

Nuclear energy chain reaction , nuclear materials, reactor, nuclear fission , nuclear fusion, characteristics of automatic power plants, nuclear fuels , working principle of nuclear reactor, classification of reactors, working principle of PWR and BWR , Gas – Cooled reactor, liquid metal – cooled reactor, nuclear power in India

6.0 Environment Pollution.

Introduction - Pollutants particulate/solid/gaseous - Thermal pollution Collection, green house gases, green house effect, global warming. Nuclear waste disposal.

REFERENCE BOOKS

1. Non conventional Energy source by G.D Rai.
2. Energy Technology by S. Rao & Dr. D.B. Palekr (Non conventional , Renewable and conventional)
3. Solar energy utilisation by G.D.Rai
4. Introduction to alternate sources of energy by TTTI, Madras
5. Solar energy by S.P. Sukhatme
6. Advances in bio-gas technology by O.P.Chawla.
8. Thermal Engineering by Arora & S. Domkundwar

CAM

Subject Title : Computer Aided Manufacturing
Subject Code : M – 604
Periods per week : 03
Period per semester : 45

TIME SCHEDULE

Sl No.	Major Topics	No. of periods	Weightage	Short	Essay
1.	Introduction to CAM	07	26	02	02
2.	CNC Machines and their components	10	29	03	02
3.	CNC Part Programming	12	26	02	02
4.	CIMS & Flexible Manufacturing Systems	10	16	02	01
5.	Robotics	06	13	01	01
TOTAL		45	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to

1. Understand Computer Aided Manufacturing

1.1. Define CAM
1.2. List the functions of CAM
1.3. Appreciate the advantages of CAM
1.4. Explain the computer integrated production system
1.5. Explain the terms related to material requirement planning (MRP I) and Manufacturing resources planning (MRP II)

2. Understand CNC Machines and their Components

2.1. Define numerical control
2.2. Identify the components of NC & CNC systems
2.3. Differentiate between NC, CNC & DNC systems
2.4. Explain Manufacturing Methodology on NC system
2.5. Illustrate the working principle of CNC system
2.6. Define Machining Centre
2.7. Identify the maintenance aspects of CNC machines
2.8. Appreciate the role of CNC in computer integrated manufacturing environment
2.9. Identify the various spindle drives
2.10 Illustrate slide ways
2.11 Explain the linear motion bearings, recirculatory ball screws
2.12 Appreciate the importance of automatic tool change

2.13 Illustrate tool magazine
2.14 Identify the various feed back devices

3. Understand the CNC Part Programming

3.1. Explain the structure of NC part program
3.2. Differentiate between manual and computer aided programming methods
3.3. Explain G & M codes
3.4. Explain the method of programming tool information, feed, speed data
3.5. Identify the various programming cycles like thread cutting cycle etc.
3.6. Write a part program in G & M codes for a simple turning job
3.7. Appreciate the importance of macros, sub routines, canned cycles, mirror image
3.8. Appreciate the necessity of tool nose radius compensation in programming
3.9. Explain APT programming

4. Understand the concept of CIMS & FMS

4.1. Define CIMS
4.2. Appreciate the necessity of CIMS
4.3. Appreciate the advantages of CIMS
4.4. Identify FMS as a sub set of CIMS
4.5. Identify the components of FMS
4.6. Illustrate the working of FMS
4.7. Identify the benefits of FMS
4.8. Appreciate the importance of coordinate measuring machine.
4.9. Illustrate the main features of CNC, CMM
4.10.List the Advantages of CNC, CMM

5. Understand Robotics

5.1. Define a robot
5.2. Classify robots
5.3. Identify the various elements of a robot
5.4. Illustrate the working of a manipulator
5.5. Illustrate the types of end effectors
5.6. Identify the applications of robots
5.7. Appreciate the role of robots in CIMS

COURSE CONTENT

1. Computer Aided Design and Manufacturing

1.1. CAM definition
1.2. Functions of CAM
1.3. Benefits of CAM
1.4. Integrated CAD / CAM Organization - concept
1.5. Computer integrated production system – features and advantages
1.6. Introductory treatment to MRP I & II

2. CNC Machines and their components

2.1. Introduction to numerical control
2.2. Features of NC system – advantages and limitations in comparison to conventional systems
2.3. Components of NC system – layout showing control unit, data input, feed back devices and machining unit

2.4. Manufacturing methodology on NC system – preparation of manuscript – programming – input to control unit – manufacturing
2.5. Development of CNC and DNC systems – comparative treatment of features for NC, CNC, DNC
2.6. Block diagram of CNC system and functions of each component
2.7. Working principle of CNC system – advantages over NC system
2.8. Types of turning centers – machining centers – horizontal, vertical
2.9. Specifications of CNC machines.
2.10. Care and maintenance of CNC machines
2.11. Spindle drives – DC drive – AC drive and linear induction motors
2.12. Slide ways – types with illustrations
2.13. Bearings – linear motion bearings – recirculatory ball screws
2.14. Automatic tool change – working of tool magazine
2.15. Feedback devices – encoders – linear transducers'

3. CNC Part programming

3.1. CNC program procedure – coordinate system – reference points – zero points
3.2. Preparatory and miscellaneous functions (G & M codes)
3.3. Methods of part programming – manual and APT programming
3.4. Tool information – speed – feed data
3.5. Interpolation – linear and circular
3.6. Macros – subroutines – canned cycles – mirror image – thread cutting cycles
3.7. Programming Practice problems on turning jobs

4. CIMS & FMS

4.1. Computer integrated manufacturing system – definition – features – necessity
4.2. Flexible manufacturing system – definition – features – necessity
4.3. Components of FMS – functions of each component – illustration
4.4. Advantages and limitations of FMS
4.5. Coordinate measuring machine – Introduction, CMM and CNC CMM – main features of CNC CMM – Scanning – Digitization – Advantages.

5. Robotics

5.1. Definition of robot – classification – features – necessity
5.2. Components of robot – illustration – functions of each component
5.3. Manipulator – illustration – degrees of freedom
5.4. End effectors - types with illustration – necessity and application
5.5. Industrial application of robots – advantages and limitations
5.6. Artificial intelligence – introductory treatment only

REFERENCE BOOKS:

1. Computer Integrated Design And Manufacturing,McGraw Hill–Bedworth David. D
2. Computer Integrated Manufacturing, PHI – Paul G. Ranky
3. Industrial Robotics, PHI – Gordon. N. Mair
4. Numerical Control And Computer Aided Manufacturing – T.K.Kundra,P.N.Rao(TMH)
5. Computer Aided Manufacturing,–T. K. Kundra, P.N. Rao (MGH Publishers)
6. CNC Machines, New Age–B.S. Pabla and M. Adithan

MEASUREMENT & CONTROL SYSTEMS

Subject Title : Measurement & Control Systems
Subject Code : M – 605
Periods per week : 05
Period per semester : 75

TIME SCHEDULE

Sl No.	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Type Questions
1.	Measuring Instruments & their Characteristics	12	16	02	01
2.	Measurement errors	06	13	01	01
3.	Transducers	20	26	02	02
4.	Measurement of Angular Speed, Temperature, Pressure and Flow	25	39	03	03
5.	Control Systems	12	16	02	01
	TOTAL	75	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to:

1. Understand the Measurement systems & their characteristics

1.1 Define Measurement
1.2 Explain the Significance of measurement
1.3 **Methods of Measurements**-
Explain
a.Direct and Indirect
b.Primary ,Secondary and Tertiary
c.Contact and Non-contact
1.4 Classify Instruments
1.5 List the Instruments and Measuring Systems-Its Functions
1.6 List the Applications of measurement systems
1.7 List the Instrument characteristics (Static & Dynamic)
Explain Static Characteristics:
1.7.1 Scale range and scale span
1.7.2 Scale readability
1.7.3 Repeatability and reproducibility
1.7.4 Drift
1.7.5 Noise- signal to noise ratio- sources of noise
1.7.6 Accuracy and precision
1.7.7 Static sensitivity

1.7.8 Linearity
1.7.9 Hysteresis
1.7.10 Threshold
1.7.11 Dead time and dead zone
1.7.12 Resolution or discrimination

Explain Dynamic Characteristics:

1.7.13 Speed of response and measuring lag
1.7.14 Fidelity and dynamic error
1.7.15 Overshoot

2. Understand the Measurement Errors

2.1 Explain the scope of Errors
2.2 Classify errors and explain
- 2.2.1 Instrument errors
- 2.2.2 Environmental errors
- 2.2.3 Translation and signal transmission errors
- 2.2.4 Observation errors
- 2.2.5 Operational errors
- 2.2.6 System interaction errors

2.3 Factors to be considered for selecting an instrument

3. Understand the Transducers

3.1 Define Transducer
3.2 Explain Mechanical detector-transducer elements
- 3.2.1 Elastic elements
- 3.2.2 Mass sensing elements
- 3.2.3 Thermal detectors
- 3.2.4 Hydro-pneumatic elements

3.3 Classify Transducers
Explain
- 3.3.1 on the basis of transduction form used,
- 3.3.2 Primary and secondary transducers
- 3.3.3 Passive and active transducers
- 3.3.4 Analog and digital transducers

3.4 Explain Resistive transducer, piezo electric transducer, capacitive transducer
3.5 Define Strain gauges
- 3.5.1 List the requirements of strain gauge
- 3.5.2 Explain the types of strain gauges
- 3.5.3 Explain unbounded metal strain gauges
- 3.5.4 Explain Bonded metal wire strain gauges
- 3.5.5 Explain Bonded metal foil strain gauges
- 3.5.6 Explain Bonded semiconductor strain gauges

3.6 Explain Rosettes

4. Understand the Measurement of Angular Speed, Temperature, Pressure and Flow

Measurement of angular speed

4.1 List the types of Tachometers

4.2 Explain the working principle of following Tachometers with a legible sketch

4.2.1 Mechanical Tachometers-Revolution counter and timer, slipping Clutch Tachometer

4.2.2 Electrical Tachometers-Drag cup tachometer, and Tachogenerator

4.2.3 Contactless Electrical Tachometer-Inductive pickup, and Capacitive, pickup tachometer

Measurement of Temperature

4.3 List the types of Thermometers

4.3.1 Explain Liquid in glass thermometer

4.3.2 Explain Bimetallic thermometer

4.3.3 Explain Thermocouples

4.3.4 Explain Thermistor

4.3.5 Explain Pyrometers-Radiation and Optical

Measurement of Pressure

4.4 List the Types of pressure measurement devices

4.4.1 Explain Bourdon tube pressure gauge

Measurement of Flow

4.5 List the Types of Flow meters

4.5.1 Explain Rota meters

4.5.2 Explain hot wire anemometer (constant temp and constant Current)

4.5.3 Explain Ultrasonic flow meter

5. Understand the Control Systems

5.1 Explain the Concept of a control system

5.2 List the Elements of Control Systems

5.3 Classify control systems-

5.4 Explain the following with legible sketch

5.4.1 Open loop and Closed loop systems

5.4.2 Servo mechanisms

5.4.3 Rotational system

5.4.4 Electrical systems

5.4.5 Analog systems

5.4.6 Pneumatic controller

5.4.7 Pneumatic relay, Pneumatic Actuator

5.4.8 Hydraulic control systems

5.5 List the Applications of Pneumatic control systems

COURSE CONTENT

1. **Measurement systems & their characteristics**

Definition of Measurement, Significance, Methods of Measurements, Classification of Instruments, Instruments and Measuring Systems-Its functions,

Applications of measurement systems, Instrument characteristics (Static & Dynamic)

2. **Measurement of Errors**

Classification of errors- Instrument errors, Environmental errors, Translation and signal transmission errors, Observation errors, Operational errors, System interaction errors, Factors to be considered for selecting an instrument

3. **Transducers**

Mechanical detector-transducer elements, Transducer-Classification of Transducers, Resistive transducer, piezo electric transducer, capacitive transducer, Strain gauges -requirements of strain gauge-types, Rosettes

4. **Measurement of Angular Speed, Temperature ,pressure and Flow**

Measurement of angular speed-Tachometers, Mechanical Tachometers-Electrical Tachometers-Contactless Electrical Tachometer
Measurement of Temperature-Thermometer, Liquid in glass thermometer, Bimetallic thermometer, Thermocouples, Thermistor, Pyrometers-Radiation and Optical
Measurement of Pressure-Types , Bourdon tube pressure gauge
Measurement of Flow- Rotameters, Hot wire anemometer(constant temp and constant current) and Ultrasonic flow meter

5. **Control Systems**

What is a control system- Classification, Open loop and Closed loop systems-Servo mechanisms-Rotational systems- Electrical systems-Analog systems-Pneumatic controller-Pneumatic relay- Pneumatic Actuator-Hydraulic control systems
Elements of Control Systems
Applications of Pneumatic control systems

REFERENCE BOOKS :

1. Mechanical Measurements and Instrumentation & Control – A.K.Sawhney Puneet Sawhney (Dhanpat Rai & Co)
2. Mechanical Measurements & Control-Dr.D.S.Kumar (Metropolitan book co.Pvt.Ltd)
3. Mechanical Measurements & Control-- R.V.Jalgaonkar
4. Instrumentation Devices & Systems -- C.S.Narang
5. Mechanical & Industrial Measurements -- R.K.Jain
6. Instrumentation,Measurement and Analysis -- B.C.Nakra and Chaudhry

AUTOMOBILE ENGINEERING

Subject Title : **Automobile Engineering**
Subject code : **M-606**
No. of periods/week : **04**
Periods/Semester : **60**

TIME SCHEDULE

S.No	Major Topics	Number of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Introduction & Chassis Construction	10	16	2	1
2	Transmission & Clutches	16	32	4	2
3	Propeller shaft and rear axle	10	18	1	1 ½
4	Suspension system	06	13	1	1
5	Front axle and steering	12	18	1	1 ½
6	Brakes	06	13	1	1
	Total	**60**	**110**	**10**	**08**

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the concept of automobile

1.1 List the various components of an automobile.
1.2 Explain the function of basic structure, power plant, transmission system, auxiliaries, controls of the automobiles.
1.3 List the various types of Chassis construction.
1.4 Explain conventional Chassis construction with a legible sketch
1.5 Explain Frame construction.
1.6 List the materials for frame
1.7 List the Defects in Frames.
1.8 Explain the frameless construction.

2.0 Understand the Transmission &Working principle of Clutches

2.1 Define the term Transmission.
2.2 State the Functions of transmission system.
2.3 Explain the Concept of total resistance to the vehicle motion – tractive effort- Necessity of transmission.
2.4 List the Types of gear boxes.
2.5 Explain the Selector Mechanism with legible sketch

2.6 Explain the Lubrication of gear box.
2.7 State the requirements for the effective functioning of Clutch.
2.8 List the Components of clutch.
2.9 Explain Mechanical operation of clutch.
2.10 List the main types of clutches.
2.11 State the Principle of friction clutches.
2.12 List the Different types of dry friction clutches.
2.13 Explain the Hydraulically operated (Fluid type) clutch with legible sketch

3.0 Understand the function of Propeller Shaft and rear axle.

3.1 State the functions of propeller shaft.
3.2 Explain construction of propeller shaft.
3.3 Know about various universal joints in automobile
3.4 Functions and operation of a differential in an automobile.
3.5 Sketch general arrangement of a live rear axle
3.6 Identify loads on rear axle.
3.7 Identify different methods of supporting rear axle.
3.8 Distinguish between semi-Floating and fully floating rear axle.

4.0 Understand the working of Suspension System

4.1 List the Objectives of vehicle suspension.
4.2 List the various factors considered for suspension
4.3 List the different types of suspension springs
4.4 Explain the Construction details of leaf spring and its mounting on front and rear axles with legible sketch.
4.5 List the Different types of rubber springs.
4.6 Explain air suspension system with legible sketch.
4.7 Explain the principle of shock absorber.
4.8 Explain the construction details and working of a telescopic type of shock absorber with legible sketch.

5.0 Understand the function of Front Axle and Steering.

5.1 Define the terms Front Axle and Steering.
5.2 Define Stub Axle type.
5.3 Explain the Front wheel assembly
5.4 List the Factors of wheel alignment.
5.5 Explain the Balance of wheels-Inflation of tyres- Brake Adjustment.
5.6 Explain the Steering geometry
5.7 List Steering linkages.

5.8 Write correct steering angle.
5.9 Explain the Steering mechanism with legible sketch
5.10 Explain cornering force – Self righting torque.
5.10 Explain under steering – over steering.
5.11 Write the Principle of power steering.

6.0 Understand the function of Brakes

6.1 List the requirements of automobile brake.
6.2 Explain the transfer of weight during braking operation.
6.3 Explain the wheel skidding and techniques to prevent wheel Skidding.
6.4 Various factors influencing braking effect.
6.5 Classify the brakes.
6.6 Describe the mechanical shoe brake with legible sketch.
6.7 Draw a simple diagram to show the layout of a hydraulically operated four wheel brake system and explain its working in detail.
6.8 Draw a schematic diagram showing the layout of complete air pressure system of brakes and explain the working of its main units in detail.

COURSE CONTENT

1.0 Introduction & Chassis construction

1.1 Identify the various components of an automobile.
1.2 The basic structure, the power plant, transmission System, the auxiliaries the controls and the superstructure of an automobile.
1.3 Different types of Chassis construction.
1.4 The functions of the Frame.
1.5 The loads on the frame,
1.6 Frame construction with a neat sketch.
1.7 Identification of various materials for frame.
1.8 Sub frames and defects in frames.
1.9 Frameless construction with a sketch.

2.0 Transmission and Clutches

2.1 Introduction and Functions of transmission system
2.2 Concept of total resistance to the vehicle motion – Tractive effort – necessity of transmission.
2.3 Working of Sliding mesh – Constant mesh – Synchromesh gear boxes.
2.4 Working of selector mechanism with gear lever on top of transmission case.

2.5 Lubrication of gear box.
2.6 Functions of clutches.
2.7 Requirements of Clutch.
2.8 Brief description of Components of clutch, clutch plate- clutch facing – pressure plate – Springs – Bearings.
2.9 Mechanical operation of clutch.
2.10 Main types of clutches (friction clutch and fluid clutch only)
2.11 Principle of friction clutches – coefficient of friction (μ), Axial Pressure (w) and mean radius of contact surfaces(R)
2.12 Description and working of dry friction clutches – Single plate multi plate.
2.13 Working of Hydraulically operated single plate clutch.

3.0 Propeller Shaft and rear axle.

3.1 The functions of propeller shaft.
3.2 The construction of propeller shaft with a neat sketch.
3.3 Various universal joints in automobiles.
3.4 The function and operation of differential in an automobile.
3.5 The general arrangement of a live rear axle.
3.6 Different loads on rear axle.
3.7 Different methods of supporting rear axle shafts with sketch.
3.8 The difference between semi-floating and fully floating rear axle.

4.0 Suspension System

4.1 The objectives of vehicle suspension
4.2 The factors to be considered for suspension system.
4.3 Different types of suspension springs.
4.4 The construction of leaf spring and how it is mounted on rear and front axles with neat sketch.
4.5 Different types of rubber springs.
4.6 The action of air springs
4.7 The schematic diagram showing the layout of an air suspension system and describe its working
4.8 The principle, construction and working of a telescope type of shock absorber.

5.0 Front Axle and Steering

5.1 Introduction to front axle.
5.2 Stub axle connection- ELLIOT – Reversed ELLIOT – LAMOINE – Reversed LAMOINE – brief Description.

5.3 Description of front wheel stub axle assembly.

5.4 Factors influencing of wheel alignment .

5.5 Factors pertaining to wheels – Balance of Wheels - Inflation of tyres – Brake adjustment-Concept of Steering Geometry – Camber – Kingpin Inclination – combined angle - castor – Toe-in & Toe-out.

5.6 Steering linkage – principle of correct steering angle (without mathematical analysis) simple equation

5.7 Details of Ackerman steering mechanism.

5.8 Concept of cornering force-self righting torque.

5.9 Concept of under steering & over steering.

6.0 Brakes

6.1 The requirements of a automobile brake.

6.2 The transfer of weight during braking operation.

6.3 The wheel skidding and describe techniques to prevent wheel Skidding.

6.4 Various factors influencing braking effect.

6.5 Classification of brakes.

6.6 The mechanical shoe brake with a neat sketch.

6.7 The layout of a hydraulically operated four wheel brake system with a simple diagram and explain its working in detail.

6.8 The schematic diagram showing the layout of complete air brake system and explain the working of its main units in detail.

REFERENCE BOOKS:

1. The motor vehicle - Newton steeds & Garret
2. Automotive Chassis - P.M. Heldt.
3. Mechanism of the car - A.W. Judge
4. Automotive mechanism - Joseph Heitner.
5. Automotive Engineering - G.B.S. Narang

CAM LAB PRACTICE

Subject Title	**:**	**CAM Lab Practice**
Subject Code	**:**	**M-607**
Periods/ week	**:**	**06**
Periods per Semester	**:**	**90**

OBJECTIVES

Up on completion of the course the student shall be able to

1. Identify the parts and functions of CNC lathe
2. Use incremental system and absolute system on dimensioning.
3. Write simple part program using G-Codes and M-Codes.
4. Edit and execute a part program using CNC lathe machine simulation package.
5. Prepare part program as per the drawing.
6. Produce part as per the drawing using CNC lathe machine.

COURSE CONTENT

1. CNC Introduction
2. Study of turning.
3. G – codes and M- codes
4. Simulation software practice.
5. Structure of program.
6. Turning exercise – step turning using canned cycle.
7. Turning exercise – circuits interpolation CW, CCW.
8. Turning Exercise - Taper turning and Peck drilling.
9. Turning exercise – Thread cutting and grooving.

Note: ***The simulation software available in the market:***
FANUC, SIEMENS, HI NUMERIC, GSK etc.,

Key competencies to be achieved by the student

	Exercise	Key competencies expected
1	Hands on practice on CNC machine	A. Identify the various parts and switches B. Operate the various parts and knobs of the machine - Switch on / off
2	Practice turning Operation on CNC machine	A. Use incremental system and absolute system of co-ordinate system B. Use appropriate tools for turning C. Select the speeds and feeds used for turning D. Select the depth of cut to be employed
3	Use G-Codes and M-Codes to write part program	A. Identify the preparatory and miscellaneous functions of CNC B. Understand the meanings of various G-Codes and M-Codes C. Identify frequently used G-Codes and M-Codes
4	Practice with Simulation software	A. Understand the concept of simulation B. Practice the setting of software in simulation mode C. Open an existing part program D. Practice simulation for the program
5	Read the Structure of program	A. Understand the block numbers B. Understand various steps in the program
6	Practice step turning canned cycle (Turning exercise)	A. Understand the canned cycle B. Write a part program to produce the part as per the given drawing C. Enter the program in the software D. Fix the job and set the tool E. Select proper cutting speed, depth of cut and feed for the given job F. Simulate the program and edit if necessary G. Execute the part program
7	Practice Turning exercise circuits interpolation CW, CCW	A. Understand interpolation B. Use the codes for interpolation in part program C. Write and enter the program in the system D. Simulate and execute the program

	Exercise	Key competencies expected
8	Practice Turning exercise – Taper turning and Peck drilling	A. Select proper values of cutting speeds and feeds for taper turning and peck drilling B. Write part program for taper turning and peck drilling as per the given drawing C. Select suitable cutting tools for the two operations separately D. Fix the tools in the turret E. Fix the job F. Simulate and edit the part program if necessary G. Execute the part program
9	Practice Turning exercise – Thread cutting and grooving	A. Select proper values of cutting speeds and feeds for Thread cutting and grooving B. Write part program for Thread cutting and grooving as per the given drawing C. Select suitable cutting tools for the two operations separately D. Fix the tools in the turret E. Fix the job F. Simulate and edit the program if necessary G. Execute the part program

THERMAL ENGINEERING & REFRIGERATION AND AIR CONDITIONING LABORATORY PRACTICE

Subject Title : **Thermal Engineering& Refrigeration and Air Conditioning Lab Practice**
Subject Code : **M – 608**
Periods per Week : **03**
Periods per Semester : **45**

A.THERMAL ENGINEERING LABORATORY PRACTICE

TIME SCHEDULE

S.No	Name	Number of Periods
1	Economic Speed Test	03
2	Water Cooling Curves	03
3	Morse Test	03
4	Performance Curves	06
5	Heat Balance Sheet	06
6	Mercet Boiler	03
Total		**24**

OBJECTIVES

Up on completion of the course the student shall be able to

1. **Understand the importance of economic speed of given S.I. / C.I. engine.**
   - 1.1 Identify the type of engine and its parts
   - 1.2 Circulating cooling water through the engine jacket before starting the engine and after shutting the engine
   - 1.3 Cranking the engine and operating decompression lever
   - 1.4 Maintain constant load
   - 1.5 Varying the fuel supply by operating the lever
   - 1.6 Record the corresponding readings of fuel consumption and speed

2. **Appreciate the importance of drawing water cooling curves on IC engines.**
   - 2.1 Identify the type of engine and its parts
   - 2.2 Circulate cooling water through the engine jacket before starting the engine and after shutting the engine
   - 2.3 Crank the engine and operating decompression lever
   - 2.4 Maintain constant load and speed
   - 2.5 Control flow rate of cooling water into the engine
   - 2.6 Record the readings of cooling water temperatures at inlet and outlet.
   - 2.7 Record the fuel consumption rate by using stop watch

3. **Understand the importance of Morse test on multi-cylinder petrol / diesel engine**
    - 3.1 Identify the type of engine
    - 3.2 Circulate cooling water through the engine jacket before starting the engine and after shutting the engine
    - 3.3 Crank the engine and operating decompression lever
    - 3.4 Vary the load
    - 3.5 Maintain constant speed
    - 3.6 Disconnect engine cylinders one by one by operating the lever
    - 3.7 Record the readings in spring balance without parallax error

4. **Understand the importance of performance characteristics of given IC engine.**
    - 4.1 Identify the type of engine and its parts
    - 4.2 Circulate cooling water through the engine jacket before starting the engine and after shutting the engine
    - 4.3 Crank the engine and operating decompression lever
    - 4.4 Vary the load
    - 4.5 Record the load
    - 4.6 Record the speed by using tachometer
    - 4.7 Handle the stop watch for measuring time for 10c.c consumption of fuel
    - 4.8 Draw the graphs (B.P. Vs R.P.M., B.S.F.C. Vs R.P.M., B.M.E.P. Vs R.P.M., Mechanical Efficiency Vs R.P.M.,)

5. **Understand the importance of heat balance of given IC engine.**
    - 5.1 Identify the type of engine and its parts
    - 5.2 Circulate cooling water through the engine jacket before starting the engine and after shutting the engine
    - 5.3 Crank the engine and operating decompression lever
    - 5.4 Adjust the load
    - 5.5 Identify the cooling water inlet and outlet
    - 5.6 Record the reading of cooling water temperature at inlet and outlet
    - 5.7 Record time taken for 10c.c fuel consumption
    - 5.8 Record exhaust gas temperature
    - 5.9 Calculate on of quantity of heat liberated by the fuel and the heat equivalent of brake power, heat carried away the jacket cooling water and heat carried away by the exhaust gases.

6. **Appreciate the pressure Vs temperature relationship of saturated steam by using Mercet Boiler.**
    - 6.1 Identify type of boiler and various parts of it.
    - 6.2 Heat the water filled in boiler drum by using Bunsen burner
    - 6.3 Identify the formation of saturated steam
    - 6.4 Record the readings of pressure and temperature
    - 6.5 Draw the graph between Pressure Vs Temperature.

COURSE CONTENT

1. Economic speed Test.
2. Water cooling curves.
3. Morse test on petrol / diesel engine.
4. Performance curves.
5. Heat Balance Sheet.
6. Investigation of Pressure Vs Temperature relationship of saturated steam by using Mercet boiler.

Key competencies Expected from the student for Thermal Engineering Lab (M-608A)

S.No	Exercise	Key competency
1	Economic speed Test	a. Circulate cooling water through the engine jacket before starting the engine and after shutting the engine b. Maintain a constant load c. Vary the fuel supply by operating the lever d. Record the corresponding readings of fuel consumption and speed
2	Water cooling curves	a. Identify valve to allow cooling water into the engine b. Maintain constant load and speed c. Record load and speed d. Control flow rate of cooling water into the engine e. Record the readings of cooling water temperatures at inlet and outlet. f. Record the fuel consumption rate by using stop watch g. Draw graphs (s.f.c. Vs exit temperature of cooling water)
3	Morse test on multi-cylinder diesel / petrol engine	a. Vary the load b. Maintain constant speed c. Disconnect engine cylinders one by one by operating the lever d. Record the readings in spring balance without parallax error

4	Performance curves	a. Vary the load b. Record the load c. Record the speed by using tachometer d. Handle the stop watch for measuring time for 10c.c consumption of fuel e. Draw the graphs (B.P. Vs R.P.M., B.S.F.C. Vs R.P.M., B.M.E.P. Vs R.P.M., Mechanical Efficiency Vs R.P.M.,)
5	Heat balance sheet	a. Allow cooling water to enter the cylinder jacket. b. Adjust the load c. Record the load and speed d. Record the reading of cooling water temperature at inlet and outlet e. Record time taken for 10c.c fuel consumption f. Record exhaust gas temperature
6	Mercet boiler	a. Record the readings of pressure and temperature b. Draw the graph between pressure Vs temperature.

B. REFRIGERATION & AIR CONDITIONING LAB PRACTICE

TIME SCHEDULE

S.No	R & AC Lab	Number of Periods
1	Familiarisation with R&AC Tools Basic Operations on soft Copper tube	03
2	C O P of Vapour Compression cycle test rig	03
3	C O P of domestic refrigerator test rig	03
4	C O P of water cooler test rig	03
5	Leak detection of refrigeration equipment	03
6	Evaluate the C.O.P. of A.C. system	03
7	Vaccumisation and Charging of compressor	03
Total		**21**

OBJECTIVES

Up on completion of the course the student shall be able to

1. Identify various tools used in R&AC
2. Perform basic fabrication operations viz., flaring, swaging, bending and brazing on soft copper tubes.
3. Identify the various components of a Vapour Compression cycle test rig and to draw the refrigerant circuit and the electrical circuit.
4. Evaluate the c.o.p of a given Vapour Compression cycle test rig.
5. Evaluate the c.o.p of a Domestic Refrigerator test rig
6. Evaluate the c.o.p of a water cooler test rig
7. Identify various types leak detection methods of a refrigeration system
    a. Detect the leakages of given vapour compression refrigeration system by using soap solution method.
    b. Apply the methods of arresting leakages
    c. Arrest the leakages if any by soldering
8. Evaluate the C.O.P. of given air-conditioning system
9. Apply the method of vaccumization and refrigerant charging for a given vapour compression system.
    a. Evacuate the given V.C.R. system using a vacuum pump
    b. Charge the given V.C.R. system by using suitable refrigerant gas
    c. Run the system for at least 15 min. and check for the build up of pressure in the pressure gauge.

Key competencies Expected from the student for M-608B Refrigeration & Air Conditioning Lab

S.No	Exercise	Key competency
1	Basic fabrication operations on soft copper tube	a. Use the tools to perform flaring, swaging, bending and brazing operations
2	C O P of Vapour Compression cycle test rig.	a. Identify the components of vapour compression system b. Record the values of pressure and temperature when the pressure gauges are stabilized c. Record the energy meter reading d. Read the values from Pressure Vs Enthalpy diagram of the given refrigerant e. Evaluate c.o.p
3	C.O.P. of domestic refrigerator test rig	a. Identify the components of domestic refrigerator test rig. b. Record the values of pressure and temperature when the pressure gauges are stabilized c. Record the energy meter reading d. Read the enthalpy values from Pressure Vs Enthalpy diagram of the given refrigerant e. Evaluate c.o.p
4	C.O.P. of water cooler test rig	a. Identify the components of water cooler test rig. b. Record the values of pressure and temperature when the pressure gauges are stabilized c. Record the energy meter reading d. Read the enthalpy values from Pressure Vs Enthalpy diagram of the given refrigerant e. Evaluate c.o.p

5	Leak detection of refrigeration equipment	a. Apply soap solution over suction lines, discharge lines and various joints b. Detect the leaks by observing the air bubbles c. Arrest the leaks if any by using soldering
6	Evaluate C.O.P. of A.C. system	a. Identify the components of given vapour compression air-conditioning test rig. b. Insert thermometers in suction line and discharge line c. Run the given V.C. A.C. system for some time d. Record the pressure and temperature readings when the pressure gauges are stabilized. e. Record the energy meter reading f. Read the enthalpy values from Pressure Vs Enthalpy diagram of the given refrigerant g. Evaluate c.o.p
7	Vacuumization and charging of refrigeration system	a. Detect the leaks in the given refrigeration system b. Arrest the leaks if any c. Evacuate the system by using a vacuum pump d. Charge the system by suitable refrigerant gas e. Run the system for some time and check for the build up of pressure by observing the pressure gauge reading.

COURSE CONTENT

1. Basic fabrication operations on soft copper tube.
2. Determination of COP of Vapour Compression cycle test rig.
3. Determination of COP of domestic refrigerator test rig.
4. Determination of COP of water cooler test rig.
5. Leak detection of refrigeration equipment.
6. Conduct a performance test on given air-conditioning system and evaluate C.O.P. of the system.
7. Vaccumization & Charging, pressure testing of given refrigeration system.

MANUFACTURING /SERVICING AND MAINTANANCE LAB PRACTICE

Subject Title	**:**	**Manufacturing /Servicing and Maintenance Lab Practice**
Subject Code	**:**	**M-609**
Periods/Week	**:**	**03**
Periods per Semester	**:**	**45**

Objectives

Up on completion of the course the student shall be able to

A. Understand various operations in machine shop

1. Practice the cutting operation on slotter
2. Practice the cutting operation on planer
3 Practice the principle of indexing on milling machine.
4 Perform Cutting operation on milling machine
5 Perform Cutting operation on V-block on shaping machine.

B. Understand various operations in Welding

1. Produce utility articles such as shoe rack, garden chair, wash basins, stools etc

C. Understand various operations in Foundry

1. Prepare a mould for flange coupling.
2. Understand the operation of cupola and pit furnace.
3. Prepare a metal casting of simple objects in Aluminium.

D. Understand various activities in servicing and maintenance

1. Use the servicing methods of IC-Engine parts.
2. Overhaul petrol and diesel Engines.
3. Locate faults and rectify the same.
4. Select Appropriate recovery methods for a given machine elements and Performing recovery processes by using appropriate methods such as Arc/gas welding, metal spraying, applying adhesives etc.,
5. Use the servicing methods of sewing machine, pumps
6. Use the testing and inspection methods of machine tools.
7. Dismantle and assemble machine tools.
8. Recondition the parts.
9. Service and overhaul machine of general nature.
10. Prepare maintenance schedules and estimates.

COURSE CONTENT

A. Machine Shop

1. V-Block, 2. Gear Cutting on Milling Machine, 3.Splines on Slotting Machines, 4. Practice on Planning machines, 5.Key way cutting, 6.Various Milling operations,7.T-slot cutting on milling machine

B. Welding

1.Shoe Rack 2. Garden Chair. 3. Stools 4. Pot Stands etc.,

C. Foundry

1.Solid bearing 2. Flange coupling 3.Operation of cupola 4. Metal casting and fettling.

D. Service and Maintenance

Carburettor, Injectors , Piston Assembly , Gear Box, Clutch , Valve Assembly, Propellar Shaft and Universal Joint, Differential , Axles etc.,

Sub – assembly of small components such as, Tail stock, checks of lathes, 3-jaw chuck,4-jaw chuck. Measurement of wear on M/c elements such as, lathe beds, guide ways &shapers. Selection of appropriate recovery methods for a given M/c element and performing recovery processes by using appropriate methods such as: Arc/Gas Welding, Metal spraying, Applying adhesives etc. Fault finding and repairs of equipment such as machine tools, washing machines. Maintenance of various machine tools & engines including preparation of preventive maintenance schedule of a typical workshops .

Key competencies to be achieved by the student

S.No	Exercise	Key competencies expected
1.	Key way cutting by slotting machine	A. Fix the job on slotting machine table B. Set the tool and give the table feed C. Set the stroke of the ram
2.	Indexing on slotting / milling machine	A. Identify of suitable indexing method B. Calculate revolutions of indexing crank C. Select index plate D. Select of hole circle
3.	T-slot cutting on milling machine	A. Identify T-slot cutter B. Exact setting of work-tool location
4.	Bevel / Helical gear cutting on milling machine	A. Calculate no. of teeth on meshing gears for compound indexing B. Identify suitable HOB C. Select suitable holder for bevel gear blank
5	Servicing of Carburetor, Injectors, Piston, assembly, Gear Box, Clutch , Valve Assembly, Propeller Shaft and Universal Joint, Differential , Axles etc.,	A. Select suitable dismantling/assembly tools. B. Identify the problem C. Rectify the defect D . Select suitable lubricant. E. Locate lubricating points.
6	Assembly of small components such as, Tail stock, chucks of Lathes, 3-jaw chuck, 4-jaw chuck.	A. Select suitable dismantling/assembly tools. B. Identify the problem C. Rectify the defect D. Select suitable lubricant. E. Locate lubricating points.

PROJECT WORK

Subject Title	**:**	**Project work**
Subject Code	**:**	**M-610**
Periods/Week	**:**	**06**
Periods/Semester	**:**	**90**

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Prepare technical project report.

1.1 Identify component with mechanical bias.
1.2 Design and draw the production drawings.
1.3 Prepare a project report with details of materials, processes etc.
1.4 Develop a proto type/model of the product with the facilities available in polytechnic.

2.0 Conduct survey to establish a small scale unit.

2.1 Identify and select a product with an aim to set up a small scale industry.
2.2 Conduct a detailed market survey.
2.3 List the raw materials, equipment and tools needed for the manufacture of a specified quantity.
2.4 Explore the various financial arrangements to start the manufacture of a product under technocrat scheme in small scale industrial sector.
2.5 Make a survey of requirements of the department of industries, municipal, health, inspectorate of factories for staring an industry.
2.6 Plan for a type of organisation.
2.7 Select a site.
2.8 Prepare a techno feasibility report consisting of drawings, plant layouts, building requirements, machinery and equipment requirements, raw material, labour, production and administrative staff requirements, working capital, material flow sheet, cash flow sheet, financial analysis etc.
3.0 Develop working models to show scientific and engineering principles studied in the curriculum and repair, up gradation and maintenance of equipment which are exist.

COURSE CONTENT

The following activities are envisaged in this course at study

1. Identification and selection of a product with an aim to set small scale industry.
2. Conduct of detailed market survey.
3. Preparation of production drawings.
4. List of the raw materials, equipment and tools needed for manufacturing a specified quantity.
5. Development of a prototype model of the product in workshop (if possible) with the available facilities in the Polytechnics.
6. Exploration of the various financial arrangements to start the manufacturing of the product under technocrat scheme in small scale industrial sector.

7. Detailed survey of requirements of the department of industry, municipal, health inspectorate of factories, electrical inspectorate, banks, other financial agencies etc., for starting an industry.
8. Planning for type of organisation.
9. Selection of site.
10. Preparation of techno feasibility report consisting of production drawings, plant layout, building requirements, equipment requirement, list of raw materials and their availability, tools and other items, labour force production, ministerial staff requirement, material flow sheet, cash flow sheet, financial analysis etc.
11. Working models, repairs up gradation maintenance of equipment.

Note: 1. Product selection may be done by the Polytechnic in consultation with the local industries and other agencies.

The student should submit techno feasibility report on a product selected with an aim to set up an industry in small scale sector.

Key competencies to be achieved by the student

Project work	**Key competencies expected**
Technical project report	A. Select a Product B. Design a product C. Prepare production drawings as per design D. Develop prototype model of product E. Prepare technical project report
Conduct survey to establish a small scale unit	A. Conduct market survey to identify product to be produced B. Prepare feasibility report of product C. Convince financial organizations D. Approach government agencies for technical and financial help E. Learn leadership qualities
Develop working models and upgrade/repair existing equipment	A. Develop working model using scientific and engineering principles B. Repair equipment of existing machines