# ACADEMIC REGULATIONS
# COURSE STRUCTURE
# AND
# DETAILED SYLLABUS

## CIVIL ENGINEERING

**For**

**B.Tech., FOUR YEAR DEGREE COURSE**

(Applicable for the batches admitted from 2013-14)

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

# Academic Regulations (R13) for B. Tech. (Regular)

**Applicable for the students of B. Tech. (Regular) from the Academic Year 2013-14 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 | Electronics and Communication Engineering |
| 02 | Electrical and Electronics Engineering |
| 03 | Civil Engineering |
| 04 | Mechanical Engineering |
| 05 | Computer Science and Engineering |
| 06 | Petro Chemical Engineering |
| 07 | Information Technology |
| 08 | Chemical Engineering |
| 09 | Electronics and Instrumentation Engineering |
| 10 | Bio-Medical Engineering |
| 11 | Aeronautical Engineering |
| 12 | Automobile Engineering |
| 13 | Bio Technology |
| 14 | Electronics and Computer Engineering |
| 15 | Mining Engineering |
| 16 | Petroleum Engineering |
| 17 | Metallurgical Engineering |
| 18 | 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) 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.

(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.

(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.

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) 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 II year I 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 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.**

5.5 A student shall register and put up minimum attendance in all 180 credits and earn all 180 credits. **Marks obtained in all the 180 credits shall be considered for the calculation of percentage of marks.**

**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. 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 | % of marks to be secured | |
|---|---|---|
| First Class with Distinction | 70% and above | **From the aggregate marks secured from 180 Credits.** |
| First Class | Below 70 but not less than 60% | |
| Second Class | Below 60% but not less than 50% | |
| Pass Class | Below 50% but not less than 40% | |

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

**8. Minimum Instruction Days**

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

9. There shall be no branch transfers after the completion of the admission process.

10. There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

11. **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.

12. **TRANSITORY REGULATIONS**

1. Discontinued or detained candidates are eligible for readmission as and when next offered.
2. 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**.**

13. **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.
5. The students seeking transfer to colleges affiliated to JNTUK from various other Universities/ Institutions have to pass the failed subjects which are equivalent to the subjects of JNTUK, and also pass the subjects of JNTUK on their own without the right to sessional marks which the candidates have not studied at the earlier Institution.

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# Academic Regulations (R13) for B. Tech. (Lateral entry Scheme)

Applicable for the students admitted into II year B. Tech. from the Academic Year 2014-15 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 | % of marks to be secured | |
|---|---|---|
| First Class with Distinction | 70% and above | **From the aggregate marks secured from 132 Credits from II year to IV year.** |
| First Class | Below 70% but not less than 60% | |
| Second Class | Below 60% but not less than 50% | |
| Pass Class | Below 50% but not less than 40% | |

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.<br>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 | 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 |

| | | |
|---|---|---|
| | 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. | 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.<br>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 & 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 NOT 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

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# COURSE STRUCTURE

## I Year – I SEMESTER

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | English – I | 3+1* | -- | 3 |
| 2 | Mathematics - I | 3+1* | -- | 3 |
| 3 | Engineering Chemistry | 3+1* | -- | 3 |
| 4 | Engineering Mechanics | 3+1* | -- | 3 |
| 5 | Environmental Studies | 3+1* | -- | 3 |
| 6 | Computer Programming | 3+1* | -- | 3 |
| 7 | Engineering Chemistry Laboratory | -- | 3 | 2 |
| 8 | English – Communication Skills Lab - I | -- | 3 | 2 |
| 9 | C Programming Lab | -- | 3 | 2 |
| **Total Credits** | | | | **24** |

## I Year – II SEMESTER

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | English - II | 3+1* | -- | 3 |
| 2 | Mathematics – II (Mathematical Methods) | 3+1* | -- | 3 |
| 3 | Mathematics – III | 3+1* | -- | 3 |
| 4 | Engineering Physics | 3+1* | -- | 3 |
| 5 | Professional Ethics and Human Values | 3+1* | -- | 3 |
| 6 | Engineering Drawing | 1 | 3 | 3 |
| 7 | English-Communication Skills Lab - II | -- | 3 | 2 |
| 8 | Engineering Physics Laboratory | -- | 3 | 2 |
| 9 | Engineering Physics – Virtual Labs - Assignments | -- | 2 | -- |
| 10 | Engineering Workshop & IT Workshop | -- | 3 | 2 |
| **Total Credits** | | | | **24** |

## II Year – I SEMESTER

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | Electrical & Electronics Engineering | 3+1* | -- | 3 |
| 2 | Probability & Statistics | 3+1* | -- | 3 |
| 3 | Strength of Materials-I | 3+1* | -- | 3 |
| 4 | Building Materials and Construction | 3+1* | -- | 3 |
| 5 | Surveying | 3+1* | -- | 3 |
| 6 | Fluid Mechanics | 3+1* | -- | 3 |
| 7 | Surveying Field work-I | -- | 3 | 2 |
| 8 | Strength of Materials Lab | -- | 3 | 2 |
| **Total Credits** | | | | **22** |

**II Year – II SEMESTER**

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | Building Planning & Drawing | 3+1* | -- | 3 |
| 2 | Managerial Economics and Financial Analysis | 3+1* | -- | 3 |
| 3 | Strength of Materials- II | 3+1* | -- | 3 |
| 4 | Hydraulics and Hydraulic Machinery | 3+1* | -- | 3 |
| 5 | Concrete Technology | 3+1* | -- | 3 |
| 6 | Structural Analysis - I | 3+1* | -- | 3 |
| 7 | Fluid Mechanics and Hydraulic Machinery Lab | -- | 3 | 2 |
| 8 | Concrete Technology Lab | -- | 3 | 2 |
| 9 | Surveying Field work-II | -- | 3 | 2 |
| **Total Credits** | | | | **24** |

**III Year – I SEMESTER**

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | Engineering Geology | 3+1* | -- | 3 |
| 2 | Structural Analysis – II | 3+1* | -- | 3 |
| 3 | Design and Drawing of Reinforced Concrete Structures | 3+1* | -- | 3 |
| 4 | Geotechnical Engineering – I | 3+1* | -- | 3 |
| 5 | Transportation Engineering – I | 3+1* | -- | 3 |
| 6 | IPR & Patents | 3+1* | -- | 2 |
| 7 | Geotechnical Engineering Lab | -- | 3 | 2 |
| 8 | Engineering Geology Lab | -- | 3 | 2 |
| **Total Credits** | | | | **21** |

**III Year – II SEMESTER**

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | Design and Drawing of Steel Structures | 3+1* | -- | 3 |
| 2 | Geotechnical Engineering – II | 3+1* | -- | 3 |
| 3 | Water Resources Engineering–I | 3+1* | -- | 3 |
| 4 | Environmental Engineering – I | 3+1* | -- | 3 |
| 5 | Transportation Engineering – II | 3+1* | -- | 3 |
| 6 | **OPEN ELECTIVE** | 3+1* | -- | 3 |
| 7 | Computer Aided Engineering Drawing | -- | 3 | 2 |
| 8 | Transportation Engineering Lab | -- | 3 | 2 |
| **Total Credits** | | | | **22** |

**IV Year – I SEMESTER**

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | Environmental Engineering – II | 3+1* | -- | 3 |
| 2 | Prestressed Concrete | 3+1* | -- | 3 |
| 3 | Construction Technology and Management | 3+1* | -- | 3 |
| 4 | Water Resources Engineering–II | 3+1* | -- | 3 |
| 5 | Remote Sensing and GIS Applications | 3+1* | -- | 3 |
| 6 | **ELECTIVE - I** | 3+1* | -- | 3 |
| 7 | Environmental Engineering Lab | -- | 3 | 2 |
| 8 | GIS & CAD Lab | -- | 3 | 2 |
| **Total Credits** | | | | **22** |

**IV Year – II SEMESTER**

| S. No. | Subject | T | P | Credits |
|---|---|---|---|---|
| 1 | Estimating, Specifications & Contracts | 3+1* | -- | 3 |
| 2 | **ELECTIVE –II** | 3+1* | -- | 3 |
| 3 | **ELECTIVE – III** | 3+1* | -- | 3 |
| 4 | **ELECTIVE – IV** | 3+1* | -- | 3 |
| 5 | Project Work | | | 9 |
| **Total Credits** | | | | **21** |

**OPEN ELECTIVE:**

a) Environmental Pollution and Control
b) Disaster Management
c) Industrial Water & Waste Water Management
d) Architecture and Town Planning
e) Finite Element Method
f) Green Technologies

**Elective-I:**

a) Ground Improvement Techniques
b) Air Pollution and Control
c) Matrix methods of Structural Analysis
d) Urban Hydrology
e) Advanced Surveying
f) Interior Designs and Decorations

**Elective-II:**

a. Engineering with Geo-synthetics
b. Environmental Impact Assessment and Management
c. Advanced Structural Engineering
d. Ground Water Development and Management
e. Traffic Engineering
f. Infrastructure Management

**Elective-III:**

a) Advanced foundation Engineering
b) Solid waste Management
c) Earthquake Resistant Design
d) Water Shed Management
e) Pavement Analysis and Design
f) Green Buildings

**Elective-IV:**

a) Soil Dynamics and Machine Foundations
b) Environmental and Industrial Hygiene
c) Repair and Rehabilitation of Structures
d) Water Resources System Planning and Management
e) Urban Transportation Planning
f) Safety Engineering
g) Bridge Engineering

## SYLLABUS

| I Year – I SEMESTER | T | P | C |
|---|---|---|---|
| | 3+1 | 0 | 3 |

**ENGLISH –I**
**(Common to All Branches)**

**DETAILED TEXT-I English Essentials : Recommended Topics :**

1. **IN LONDON: M.K.GANDHI**

   **OBJECTIVE:** To apprise the learner how Gandhi spent a period of three years in London as a student.

   **OUTCOME**: The learner will understand how Gandhi grew in introspection and maturity.

2. **THE KNOWLEDGE SOCIETY- APJ KALAM**

   **OBJECTIVE**: To make the learners rediscover India as a land of Knowledge.

   **OUTCOME:** The learners will achieve a higher quality of life, strength and sovereignty of a developed nation.

3. **THE SCIENTIFIC POINT OF VIEW- J.B.S. HALDANE**

   **OBJECTIVE**: This essay discusses how scientific point of view seeks to arrive at the truth without being biased by emotion.

   **OUTCOME:** This develops in the student the scientific attitude to solve many problems which we find difficult to tackle.

4. **PRINCIPLES OF GOOD WRITING:**

   **OBJECTIVE**: To inform the learners how to write clearly and logically.

   **OUTCOME**: The learner will be able to think clearly and logically and write clearly and logically.

5. **MAN'S PERIL**

   **OBJECTIVE**: To inform the learner that all men are in peril.

   **OUTCOME:** The learner will understand that all men can come together and avert the peril.

6. **THE DYING SUN—SIR JAMES JEANS**

   **OBJECTIVE**: This excerpt from the book "The Mysterious Universe" presents the mysterious nature of the Universe and the stars which present numerous problems to the scientific mind. Sir James Jeans uses a poetic approach to discuss the scientific phenomena.

   **OUTCOME**: This provides the students to think about the scientific phenomena from a different angle and also exposes the readers to poetic expressions.

**7. LUCK—MARK TWAIN**

**OBJECTIVE:** This is a short story about a man's public image and his true nature. The theme of the story is that luck can be a factor of life, so that even if one is incompetent but lucky, one can still succeed.

**OUTCOME**: The story is humourous in that it contains a lot of irony. Thus this develops in the learner understand humourous texts and use of words for irony.

**Text Book** : 'English Essentials' by Ravindra Publications

**NON-DETAILED TEXT:**

**(From Modern Trailblazers of Orient Blackswan)**
**(Common single Text book for two semesters)**
**(Semester I (1 to 4 lessons)/ Semester II (5 to 8 lessons)**

**1. G.D.Naidu**

**OBJECTIVE:** To inspire the learners by G.D.Naidu's example of inventions and contributions.

**OUTCOME:** The learner will be in a position to emulate G.D.Naidu and take to practical applications.

**2. G.R.Gopinath**

**OBJECTIVE:** To inspire the learners by his example of inventions.

**OUTCOME:** Like G.R.Gopinath, the learners will be able to achieve much at a low cost and help the common man.

**3. Sudhamurthy**

**OBJECTIVE:** To inspire the learners by the unique interests and contributions of Sudha Murthy.

**OUTCOME:** The learner will take interest in multiple fields of knowledge and make life worthwhile through social service.

**4. Vijay Bhatkar**

**OBJECTIVE:** To inspire the learner by his work and studies in different fields of engineering and science.

**OUTCOME:** The learner will emulate him and produce memorable things.

**Text Book** : 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers

**I Year – I SEMESTER**

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**MATHEMATICS – I (DIFFERENTIAL EQUATIONS)**
**(Common to All Branches)**

**UNIT I: Differential equations of first order and first degree:**

Linear-Bernoulli-Exact-Reducible to exact.

Applications : Newton's Law of cooling-Law of natural growth and decay-orthogonal trajectories.

Subject Category

ABET Learning Objectives a d e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT II: Linear differential equations of higher order:**

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type $e^{ax}$, Sin ax, cos ax, polynomials in x, $e^{ax}V(x)$, xV(x).

Applications : LCR circuit, Simple Harmonic motion

Subject Category

ABET Learning Objectives a d e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT IIILaplace transforms:**

Laplace transforms of standard functions-ShiftingTheorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem (with out proof).

Application : Solutions of ordinary differential equations using Laplace transforms.

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT IV Partial differentiation:**

Introduction- Total derivative-Chain rule-Generalized Mean Value theorem for single variable (without proof)-Taylors and Mc Laurent's series for two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables with constraints and without constraints.

Subject Category

ABET Learning Objectives a c e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT VFirst order Partial differential equations:**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT VI Higher order Partial differential equations:**

Solutions of Linear Partial differential equations with constant coefficients-Method of separation of Variables

Applications : One- dimensional Wave, Heat equations - two-dimensional Laplace Equation.

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation B E

**Books:**

1. **B.S.GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
2. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
3. **GREENBERG,** Advanced Engineering Mathematics, 2nd edition, Pearson edn
4. **DEAN G. DUFFY,** Advanced engineering mathematics with MATLAB, CRC Press
5. **PETER O'NEIL,**advanced Engineering Mathematics, Cengage Learning.

| Subject Category | ABET Learning Objectives | ABET Internal Assessments | JNTUK External Evaluation | Rem -arks |
|---|---|---|---|---|
| Theory<br>Design<br>Analysis<br>Algorithms<br>Drawing<br>Others | a) Apply knowledge of math, science, & engineering<br>b) Design & conduct experiment, analyze & interpret data<br>c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints<br>d) Function on multidisciplinary teams<br>e) Identify, formulate, & solve engineering problems<br>f) Understand professional & ethical responsibilities<br>g) Communicate effectively<br>h) Understand | 1. Objective tests<br>2. Essay questions tests<br>3. Peer tutoring based<br>4. Simulation based<br>5. Design oriented<br>6. Problem based<br>7. Experiential (project based) based<br>8. Lab work or field work based<br>9. Presentation based<br>10. Case Studies based<br>11. Role-play based<br>12. Portfolio based | A. Questions should have:<br>B. Definition, Principle of operation or philosophy of concept.<br>C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference.<br>D. Design oriented problems<br>E. Trouble shooting type of questions<br>F. Applications related questions<br>G. Brain storming questions | |

| | | | | |
|---|---|---|---|---|
| | impact of engineering solutions in global, economic, environmental, & societal context<br>i) Recognize need for & be able to engage in lifelong learning<br>j) Know contemporary issues<br>k) Use techniques, skills, modern tools for engineering practices | | | |

**I Year – I SEMESTER**

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## ENGINEERING CHEMISTRY

**UNIT-I: WATER TECHNOLOGY**

Hard Water – Estimation of hardness by EDTA method – Potable water- Sterilization and Disinfection – Boiler feed water – Boiler troubles – Priming and foaming , scale formation, corrosion, caustic embrittlement, turbine deposits – Softening of water – Lime soda, Zeolite processes – Reverse osmosis – Electro Dialysis, Ion exchange process

**Objectives :** For prospective engineers knowledge about water used in industries (boilers etc.) and for drinking purposes is useful; hence chemistry of hard water, boiler troubles and modern methods of softening hard water is introduced.

**UNIT-II : ELECTROCHEMISTRY**

Concept of Ionic conductance – Ionic Mobilities – Applications of Kohlrausch law – Conductometric titrations – Galvanic cells – Electrode potentials – Nernst equation – Electrochemical series – Potentiometric titrations – Concentration cells – Ion selective electrode –Glass electrodes – Fluoride electrode; Batteries and Fuel cells.

**Objectives :** Knowledge of galvanic cells, electrode potentials, concentration cells is necessary for engineers to understand corrosion problem and its control ; also this knowledge helps in understanding modern bio-sensors, fuel cells and improve them.

**UNIT-III : CORROSION**

Causes and effects of corrosion – theories of corrosion (dry, chemical and electrochemical corrosion) – Factors affecting corrosion – Corrosion control methods – Cathodic protection –Sacrificial Anodic, Impressed current methods – Surface coatings – Methods of application on metals (Hot dipping, Galvanizing, tinning , Cladding, Electroplating, Electroless plating) – Organic surface coatings – Paints – Their constituents and their functions.

**Objectives :** the problems associated with corrosion are well known and the engineers must be aware of these problems and also how to counter them.

**UNIT-IV : HIGH POLYMERS**

Types of Polymerization – Stereo regular Polymers – Physical and Mechanical properties of polymers – Plastics – Thermoplastics and thermo setting plastics – Compounding and Fabrication of plastics – Preparation and

properties of Polyethylene, PVC and Bakelite – Elastomers – Rubber and Vulcanization – Synthetic rubbers – Styrene butadiene rubber – Thiokol – applications.

**Objectives :** Plastics are materials used very widely as engineering materials. An understanding of properties particularly physical and mechanical properties of polymers / plastics / elastomers helps in selecting suitable materials for different purposes.

**UNIT-V : FUELS**

Coal – Proximate and ultimate analysis – Numerical problems based on analysis – Calorific vaule – HCV and LCV – Problems based on calorific values; petroleum – Refining – Cracking – Petrol – Diesel knocking; Gaseous fuels – Natural gas – LPG, CNG – Combustion – Problems on air requirements.

**Objectives :** A board understanding of the more important fuels employed on a large scale is necessary for all engineer to understand energy – related problems and solve them.

**UNIT-VI : CHEMISTRY OF ADVANCED MATERIALS**

Nanometerials (Preparation of carbon nanotubes and fullerenes – Properties of nanomaterials – Engineering applications) – Liquid crystals (Types – Application in LCD and Engineering Applications) – Fiber reinforced plastics – Biodegradable polymers – Conducting polymers – Solar cells (Solar heaters – Photo voltaic cells – Solar reflectors – Green house concepts – Green chemistry (Methods for green synthesis and Applications) – Cement – Hardening and setting – Deterioration of cement concrete.

**Objectives :** With the knowledge available now, future engineers should know at least some of the advanced materials that are becoming available. Hence some of them are introduced here.

**TEXT BOOKSS**

1. Jain and Jain (Latest Edition), Engineering Chemistry, Dhanpat Rai Publishing company Ltd.
2. N.Y.S.Murthy, V.Anuradha, KRamaRao “A Text Book of Engineering Chemistry”, Maruthi Publications.
3. C.Parameswara Murthy, C.V.Agarwal, Adhra Naidu (2006) Text Book of Engineering Chemistry, B.S.Publications.
4. B.Sivasankar (2010), Engineering Chemistry, McGraw-Hill companies.

5. Ch.Venkata Ramana Reddy and Ramadevi (2013) , Engineering Chemistry, Cengage Learning.

**REFERENCES**

1. S.S. Dara (2013) Text Book of Engineering Chemistry, S.Chand Technical Series.
2. K.Sesha Maheswaramma and Mridula Chugh (2013), Engineering Chemistry, Pearson Publications.
3. R.Gopalan, D.Venkatappayya, Sulochana Nagarajan (2011), Text Book of Engineering Chemistry, Vikas Publications.
4. B.Viswanathan and M.Aulice Scibioh (2009), Fuel Cells, Principals and applications, University Press.

**I Year – I SEMESTER**

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## ENGINEERING MECHANICS

**Objectives:** The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

**UNIT – I**

**Objectives: The students are to be exposed to the concepts of force and friction , direction and its application.**

Introduction to Engg.Mechanics – Basic Concepts.

**Systems of Forces :**Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.Introduction ,limiting friction and impending motion, coulomb's laws of dry friction , coefficient of friction, cone of friction.

**UNIT II**

**Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.**

**Equilibrium of Systems of Forces :**Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

**UNIT – III**

**Objectives : The students are to be exposed to concepts of centre of gravity.**

**Centroid :**Centroids of simple figures (from basic principles ) – Centroids of Composite Figures.

**Centre of Gravity :**Centre of gravity of simple body (from basis principles), centre of gravity of composite bodies, pappus theorem.

**UNIT IV**

**Objective: The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.**

**Area moments of Inertia :** Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia :**Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

**UNIT – V**

**Objectives :The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.**

**Kinematics :**Rectilinear and Curvelinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics :**Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

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**UNIT – VI**

**Objectives: The students are to be exposed to concepts of work, energy and particle motion**

**Work – Energy Method :** Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

**TEXT BOOKS:**

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics: Statics and Dynamics 3rd edition, Andrew Pytel and Jaan Kiusalaas; Cengage Learning publishers.

**REFERENCES:**

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics , statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.

3. Engineering Mechanics , dynamics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
4. Engineering Mechanics , statics and dynamics – I.H.Shames, – Pearson Publ.
5. Mechanics For Engineers , statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
7. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
8. Engineering Mechanics , Fedinand . L. Singer , Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson, Mc Graw Hill publications.
10. Engineering Mechanics, Tayal. Umesh Publ.

**I Year – I SEMESTER**

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## COMPUTER PROGRAMMING

**Objectives:** Formulating algorithmic solutions to problems and implementing algorithms in C

**UNIT I:**
**Unit objective: Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux**
**Introduction:** Computer systems, Hardware and Software Concepts**,**
**Problem Solving:** Algorithm / Pseudo code, flowchart, program development steps, computer languages: machine, symbolic and highlevel languages, Creating and Running Programs: Writing, Editing(vi/emacs editor), Compiling( gcc), Linking and Executing in under Linux.
**BASICS OF C:** Structure of a C program, identifiers, basic data types and sizes. Constants, Variables, Arthmetic , relational and logical operators, increment and decrement operators, conditional operator, assignment operator, expressions, type conversions, Conditional Expressions, precedence and order of evaluation, Sample Programs.

**UNIT II:**
**Unit objective: understanding branching, iteration and data representation using arrays**
**SELECTION – MAKING DECISION: TWO WAY SELECTION**: if-else, null else, nested if, examples, Multi-way selection: switch, else-if, examples**.**
**ITERATIVE:** loops- while, do-while and for statements , break, continue, initialization and updating, event and counter controlled loops, Looping applications: Summation, powers, smallest and largest.
**ARRAYS**: Arrays- concepts, declaration, definition, accessing elements, storing elements, Strings and String Manipulations, 1-D arrays, 2-Darrays and character arrays, string manipulations, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a Matrix**.**
**STRINGS: concepts, c strings.**

**UNIT III:**
**Objective: Modular programming and recursive solution formulation**
**FUNCTIONS- MODULAR PROGRAMMING**: functions, basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for fibonacci series, towers of Hanoi, header

files, C Preprocessor, example c programs, Passing 1-D arrays, 2-D arrays to functions.

**UNIT IV:**
**Objective: Understanding pointers and dynamic memory allocation**
**POINTERS:** pointers- concepts, initialization of pointer variables, pointers and function arguments, passing by address- dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and multi-dimensional arrays, dynamic memory management functions, command line arguments

**UNIT V:**
**Objective: Understanding miscellaneous aspects of C**
**ENUMERATED, STRUCTURE AND UNION TYPES:** Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications
**BIT-WISE OPERATORS: logical, shift, rotation, masks.**

**UNIT VI:**
**Objective: Comprehension of file operations**
**FILE HANDLING**: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, example programs

**Text Books:**

1. Problem Solving and Program Design in C, Hanly, Koffman, 7th ed, PERSON.
2. Programming in C, Second Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.
3. Programming in C, A practical approach Ajay Mittal PEARSON.
4. The C programming Language by Dennis Richie and Brian Kernighan.
5. Programming in C, B. L. Juneja, Anith Seth, Cengage Learning.

**Reference Books:**

1. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.
2. Programming with C, Bichkar, Universities Press
3. Programming in C, Reema Thareja, OXFORD
4. C by Example, Noel Kalicharan, Cambridge

**I Year – I SEMESTER**

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## ENVIRONMENTAL STUDIES

**Course Learning Objectives:**

The objectives of the course is to impart

1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4. An understanding of the environmental impact of developmental activities
5. Awareness on the social issues, environmental legislation and global treaties.

**Course Outcomes:**

The student should have knowledge on

1. The natural resources and their importance for the sustenance of the life and recognise the need to conserve the natural resources.
2. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.
3. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
4. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
5. Social issues both rural and urban environment and the possible means to combat the challenges.
6. The environmental legislations of India and the first global initiatives towards sustainable development.
7. About environmental assessment and the stages involved in EIA and the environmental audit.

**Syllabus:**

**UNIT - I**

**Multidisciplinary nature of Environmental Studies:** Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains,

ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

**Ecosystems:** Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

**UNIT - II**

**Natural Resources:** Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources : World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources : Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources : Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

**UNIT - III**

**Biodiversity and its conservation:** Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

**UNIT - IV**

**Environmental Pollution:** Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.

**Solid Waste Management:** Sources, classification,effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

**UNIT - V**

**Social Issues and the Environment:** Urban problems related to energy - Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. - Public awareness.

**UNIT - VI**

**Environmental Management**: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism.

The student should submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

**Text Books:**

1. Environmental Studies by R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

**Reference:**

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada.
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi.
4. Environmental Studies by Piyush Malaviya, Pratibha Singh, Anoop singh: Acme Learning, New Delhi.
5. Text book at environmental science of technology M. Anji Reddy, BS Publications, Hyderabad.

**I Year – I SEMESTER**

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## ENGINEERING CHEMISTRY LABORATORY

**List of Experiments**

1. Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Quantitative analysis etc.
2. Trial experiment – Estimation of HCI using standard $Na_2co_3$ solutions.
3. Estimation of $KMnO_4$using standard Oxalic acid solution.
4. Estimation of Ferric iron using standard $K_2Cr_2O_7$ solution.
5. Estimation of Copper using standard $K_2Cr_2O_7$ solution.
6. Estimation of Total Hardness water using standard EDTA solution.
7. Estimation of Copper using standard EDTA solution.
8. Estimation of Copper using Colorimeter.
9. Estimation of pH of the given sample solution using pH meter.
10. Conductometric Titrations between strong acid and strong base
11. Conductometric Titrations between strong acid and Weak base
12. Potentiometric Titrations between strong acid and strong base
13. Potentiometric Titrations between strong acid and Weak base
14. Estimatinog of Zinc using standard potassium ferrocyanide solution
15. Estimation of Vitamin – C

**TEXT BOOKSS**

1. Dr.Jyotsna Cherukuis(2012)Laboratory Manual of Engineering Chemistry-II, VGS Techno Series
2. Chemistry Practical Manual, Lorven Publications
3. K. Mukkanti (2009) Practical Engineering Chemistry, B.S.Publication.

**I Year – I SEMESTER**

| T | P | C |
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## ENGLISH – COMMUNICATION SKILLS LAB – I

**Suggested Lab Manuals:**

**OBJECTIVE:** To impart to the learner the skills of grammar as well as communication through listening, speaking, reading, and writing including soft, that is life skills.

**BASIC COMMUNICATION SKILLS**

| | |
|---|---|
| UNIT 1 | A. Greeting and Introductions<br>B. Pure Vowels |
| UNIT 2 | A. Asking for information and Requests<br>B. Diphthongs |
| UNIT 3 | A. Invitations<br>B. Consonants |
| UNIT 4 | A. Commands and Instructions<br>B. Accent and Rhythm |
| UNIT 5 | A. Suggestions and Opinions<br>B. Intonation |

**Text Book:**

'Strengthen your Communication Skills' Part-A by Maruthi Publications

**Reference Books:**

1. INFOTECH English (Maruthi Publications).
2. Personality Development and Soft Skills ( Oxford University Press, New Delhi).

**I Year – I SEMESTER**

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## C PROGRAMMING LAB

**Exercise l**

a) Write a C Program to calculate the area of triangle using the formula area = $( s (s-a) (s-b)(s-c))^{1/2}$ where s= (a+b+c)/2

b) Write a C program to find the largest of three numbers using ternary operator.

c) Write a C Program to swap two numbers without using a temporary variable.

**Exercise 2**

a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

b) Write a C program to find the roots of a quadratic equation.

c) Write a C program, which takes two integer operands and one operator form the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

**Exercise 3**

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.

b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

**Exercise 4**

a) Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.

b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.

c) Write a C Program to check whether the given number is Armstrong number or not.

**Exercise 5**

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to implement a liner search.

c) Write a C program to implement binary search.

**Exercise 6**

a) Write a C program to implement sorting of an array of elements .

b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

**Exercise 7**

Write a C program that uses functions to perform the following operations:

i. To insert a sub-string in to given main string from a given position.

ii. To delete n Characters from a given position in a given string.

iii. To replace a character of string either from beginning or ending or at a specified location.

**Exercise 8**

Write a C program that uses functions to perform the following operations using Structure:

i) Reading a complex number

ii) Writing a complex number

iii) Addition of two complex numbers

iv) Multiplication of two complex numbers

**Exercise 9**

Write C Programs for the following string operations without using the built in functions

- to concatenate two strings
- to append a string to another string
- to compare two strings

**Exercise 10**

Write C Programs for the following string operations without using the built in functions

- to find t he length of a string
- to find whether a given string is palindrome or not

**Exercise 11**

a) Write a C functions to find both the largest and smallest number of an array of integers.

b) Write C programs illustrating call by value and call by reference cncepts.

**Exercise 12**

Write C programs that use both recursive and non-recursive functions for the following

i) To find the factorial of a given integer.

ii) To find the GCD (greatest common divisor) of two given integers.

iii) To find Fibonacci sequence

**Exercise 13**

a) Write C Program to reverse a string using pointers

b) Write a C Program to compare two arrays using pointers

**Exercise 14**

a) Write a C program consisting of Pointer based function to exchange value of two integers using passing by address.

b) Write a C program to swap two numbers using pointers

**Exercise 15**

Examples which explores the use of structures, union and other user defined variables.

**Exercise 16**

a) Write a C program which copies one file to another.

b) Write a C program to count the number of characters and number of lines in a file.

c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

**I Year – II SEMESTER**

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## ENGLISH –II
## (Common to All Branches)

**DETAILED TEXT-II :Sure Outcomes**: English for Engineers and Technologists **Recommended Topics :**

1. **TECHNOLOGY WITH A HUMAN FACE**

   **OBJECTIVE:** To make the learner understand how modern life has been shaped by technology.

   **OUTCOME**: The proposed technology is people's technology. It serves the human person instead of making him the servant of machines.

2. **CLIMATE CHANGE AND HUMAN STRATEGY**

   **OBJECTIVE**: To make the learner understand how the unequal heating of earth's surface by the Sun, an atmospheric circulation pattern is developed and maintained.

   **OUTCOME**: The learner's understand that climate must be preserved.

3. **EMERGING TECHNOLOGIES**

   **OBJECTIVE**: To introduce the technologies of the 20$^{th}$ century and 21$^{st}$ centuries to the learners.

   **OUTCOME**: The learner will adopt the applications of modern technologies such as nanotechnology.

4. **WATER- THE ELIXIR OF LIFE**

   **OBJECTIVE**: To inform the learner of the various advantages and characteristics of water.

   **OUTCOME**: The learners will understand that water is the elixir of life.

5. **THE SECRET OF WORK**

   **OBJECTIVE**::In this lesson, Swami Vivekananda highlights the importance of work for any development.

   **OUTCOME**: The students will learn to work hard with devotion and dedication.

6. **WORK BRINGS SOLACE**

   **OBJECTIVE**: In this lesson Abdul Kalam highlights the advantage of work.

   **OUTCOME**: The students will understand the advantages of work. They will overcome their personal problems and address themselves to national and other problems.

**Text Book** : 'Sure Outcomes' by Orient Black Swan Pvt. Ltd. Publishers

**NON-DETAILED TEXT:**

**(From Modern Trailblazers of Orient Blackswan)**
**(Common single Text book for two semesters)**
**(Semester I (1 to 4 lessons)/ Semester II (5 to 8 lessons)**

1. **J.C. Bose**

   **OBJECTIVE:** To apprise of J.C.Bose's original contributions.

   **OUTCOME:** The learner will be inspired by Bose's achievements so that he may start his own original work.

2. **Homi Jehangir Bhaba**

   **OBJECTIVE:** To show Bhabha as the originator of nuclear experiments in India.

   **OUTCOME:** The learner will be inspired by Bhabha's achievements so as to make his own experiments.

3. **Vikram Sarabhai**

   **OBJECTIVE:** To inform the learner of the pioneering experiments conducted by Sarabhai in nuclear energy and relevance of space programmes.

   **OUTCOME:** The learner will realize that development is impossible without scientific research.

4. **A Shadow- R.K.Narayan**

   **OBJECTIVE:** To expose the reader to the pleasure of the humorous story.

   **OUTCOME:** The learner will be in a position to appreciate the art of writing a short story and try his hand at it.

**Text Book :** 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers

**I Year – II SEMESTER**

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**MATHEMATICS – II**
**(MATHEMATICAL METHODS)**
(Common to All Branches)

**UNIT I Solution of Algebraic and Transcendental Equations:**

Introduction- Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method (One variable and Simultaneous Equestions)

Subject Category

ABET Learning Objectives a e k

ABET internal assessments 1 2 4 6

JNTUK External Evaluation A B E

**UNIT II Interpolation:**

Introduction- Errors in Polynomial Interpolation – Finite differences-Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unevenly spaced points - Lagrange's Interpolation formula.

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 4 6

JNTUK External Evaluation A B E

**UNIT III Numerical solution of Ordinary Differential equations:**

Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 4 6

JNTUK External Evaluation A B E

**UNIT IV Fourier Series:**

Introduction- Determination of Fourier coefficients – even and odd functions –change of interval– Half-range sine and cosine series

application: Amplitude, spectrum of a periodic function

Subject Category.

ABET Learning Objectives a e d
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

**UNIT V Fourier Transforms:**

Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Subject Category
ABET Learning Objectives a d e k
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

**UNIT VI Z-transform:**

Introduction– properties – Damping rule – Shifting rule – Initial and final value theorems -Inverse z transform- -Convolution theorem – Solution of difference equation by Z - transforms.

Subject Category
ABET Learning Objectives a b e k
ABET internal assessments 1 2 6
JNTUK External Evaluation A B E

**BOOKS:**


1. **B.S. GREWAL,** HigherEngineering Mathematics, 42nd Edition, Khanna Publishers
2. **DEAN G. DUFFY,** Advanced Engineering Mathematics with MATLAB, CRC Press
3. **V.RAVINDRANATH and P. VIJAYALAXMI,** Mathematical Methods, Himalaya Publishing House
4. **ERWYN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India


| Subject Category | ABET Learning Objectives | ABET Internal Assessments | JNTUK External Evaluation | Rem-arks |
|---|---|---|---|---|
| | a) Apply knowledge of math, science, & engineering<br>b) Design & conduct | 1. Objective tests<br>2. Essay questions tests | A. Questions should have:<br>B. Definitions, Principle of operation or | |

| | | | | |
|---|---|---|---|---|
| Theory<br>Design<br>Analysis<br>Algorithms<br>Drawing<br>Others | experiments, analyze & interpret data<br>c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints<br>d) Function on multidisciplinary teams<br>e) Identify, formulate, & solve engineering problems<br>f) Understand professional & ethical responsibilities<br>g) Communicate effectively<br>h) Understand impact of engineering solutions in global, economic, environmental, & societal context<br>i) Recognize need for & be able to engage in lifelong learning<br>j) Know contemporary issues<br>k) Use techniques, skills, modern tools for engineering practices | 3. Peer tutoring based<br>4. Simulation based<br>5. Design oriented<br>6. Problem based<br>7. Experiential (project based) based<br>8. Lab work or field work based<br>9. Presentation based<br>10. Case Studies based<br>11. Role-play based<br>12. Portfolio based | philosophy of concept.<br>C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference.<br>D. Design oriented problems<br>E. Trouble shooting type of questions<br>F. Applications related questions<br>G. Brain storming questions | |

**I Year – II SEMESTER**

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## MATHEMATICS – III
## (LINEAR ALGEBRA & VECTOR CALCULUS)
## (Common to All Branches)

**UNIT I Linear systems of equations:**

Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- Gauss Elimination - Gauss Jordon and Gauss Seidal Methods.

Application: Finding the current in a electrical circuit.

Subject Category

ABET Learning Objectives a e k

ABET internal assessments 1 2 6 4

JNTUK External Evaluation A B E

**UNIT II Eigen values - Eigen vectors and Quadratic forms:**

Eigen values - Eigen vectors– Properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index – signature.

Application: Free vibration of a two-mass system.

Subject Category

ABET Learning Objectives a d e k

ABET internal assessments 1 2 4 6

JNTUK External Evaluation A B E

**UNIT III Multiple integrals:**

Review concepts of Curve tracing ( Cartesian - Polar and Parametric curves)-

Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates.

Multiple integrals - double and triple integrals – change of variables – Change of order of Integration.

Application: Moments of inertia

Subject Category

ABET Learning Objectives a e d

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT IV Special functions:**

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

Application: Evaluation of integrals

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT V Vector Differentiation:**

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

Application: Equation of continuity, potential surfaces

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT VI Vector Integration:**

Line integral – work done – Potential function – area- surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems.

application: work done, Force

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**BOOKS:**

1. **GREENBERG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India.
2. **B.V. RAMANA,** Higher Engineering Mathematics, Tata Mc Grawhill.
3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India.
4. **PETER O'NEIL,** Advanced Engineering Mathematics, Cengage Learning.
5. **D.W. JORDAN AND T. SMITH,** Mathematical Techniques, Oxford University Press.

| Subject Category | ABET Learning Objectives | ABET Internal Assessments | JNTUK External Evaluation | Rema-rks |
|---|---|---|---|---|
| Theory<br>Design<br>Analysis<br>Algorithms<br>Drawing<br>Others | a) Apply knowledge of math, science, & engineering<br>b) Design & conduct experiments, analyze & interpret data<br>c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints<br>d) Function on multidisciplinary teams<br>e) Identify, formulate, & solve engineering problems<br>f) Understand professional & ethical responsibilities<br>g) Communicate effectively<br>h) Understand impact of engineering solutions in global, economic, environmenta, & societal context<br>i) Recognize need for & be able to engage in lifelong learning<br>j) Know contemporary issues<br>k) Use techniques, skills, modern tools for engineering practices | 1. Objective tests<br>2. Essay questions tests<br>3. Peer tutoring based<br>4. Simulation based<br>5. Design oriented<br>6. Problem based<br>7. Experiential (project based) based<br>8. Lab work or field work based<br>9. Presentation based<br>10. Case Studies based<br>11. Role-play based<br>12. Portfolio based | A. Questions should have:<br>B. Definitions, Principle of operation or philosophy of concept.<br>C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference.<br>D. Design oriented problems<br>E. Trouble shooting type of questions<br>F. Applications related questions<br>G. Brain storming questions | |

**I Year – II SEMESTER**

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## ENGINEERING PHYSICS

### UNIT-I

### PHYSICAL OPTICS FOR INSTRUMENTS

"Objective Designing an instrument and enhancing the resolution for its operation would be effective as achieved through study of applicational aspects of physical Optics"

**INTERFACE :** Introduction – Interference in thin films by reflection – Newton's rings.

**DIFFRACTION :** Introduction – Fraunhofer diffraction - Fraunhofer diffraction at double slit (qualitative) – Diffraction grating – Grating spectrum – Resolving power of a grating – Rayleigh's criterion for resolving power.

**POLARIZATION :** Introduction – Types of Polarization – Double refraction – Quarter wave plate ad Half Wave plate.

### UNIT-II

### COHERENT OPTICS – COMMUNICATIONS AND STRUCTURE OF MATERIALS

Objectives while lasers are trusted Non-linear coherent sources established for the fitness of instrumentation, establishing a structure property relationship for materials requires allotment of an equivalent footing in convening the physics knowledge base.

**LASERS:** Introduction – coherent sources – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Three and Four level pumping schemes – Ruby laser – Helium Neon laser.

**FIBER OPTICS :**Introduction – Principle of Optical Fiber – Acceptance angle and acceptance cone – Numerical aperture.

**CRYSTALLOGRAPHY :** Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC

**X-RAY DIFFRACTION TECHNIQUES** : Directions and planes in crystals – Miller indices – Separation between successive [h k l] planes – Bragg's law.

### UNIT-III

### MAGNETIC, ELECTRIC FIELD RESPONSE OF MATERIALS & SUPERCONDUCTIVITY

"Objective many of the Electrical or Electronic gadgets are designed basing on the response of naturally abundant and artificially made materials, while their response to E- or H- fields controls their performance.

**MAGNETIC PROPERTIES** : Magnetic permeability – Magnetization – Organ or magnetic moment – Classification of Magnetic materials – Dir, para, Ferro, anti ferro and ferri-magnetism – Hysteresis curve.

**DIELECTRIC PROPERTIES** : Introduction – Dielectric constant – Electronic, ionic and orientational polarization – internal fields – Clausius – Mossotti equation – Dielectric loss, Breakdown and Strength.

**SUPERCONDUCTIVITY** : General properties – Meissner effect – Type I and Type II superconductors – BCS Theory Flux quantization London's equations – Penetration depth – DC and AC Josephson effects – SQUIDS.

**UNIT – IV**

**ACOUSTICS AND EM – FIELDS:**

**Objective:** The utility and nuances of ever pervading SHM and its consequences would be the first hand-on to as it clearly conveyed through the detailed studies of Acoustics of Buildings, while vectorial concepts of EM fields paves the student to gear – up for a deeper understanding.

**ACOUSTICS:** Sound absorption, absorption coefficient and its measurements, Reverberations time – Sabine's formula, Eyring's formula.

**ELECTRO-MAGNETIC FIELDS**: Gauss and stokes theorems (qualitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations (Calculus approach).

**UNIT – V**

**QUANTUM MECHANICS FOR ELECTRONIC TRANSPORT**

Objective: The discrepancy between classical estimates and laboratory observations of physical properties exhibited by materials would be lifted out through the understanding quantum picture of sub-atomic world dominated by electron and its presence.

**QUANTUM MECHANICS**: Introduction to matter waves – Schrodinger Time Independent and Time Dependent wave equations – Particle in a box.

**FREE ELECTRON THEORY**: Classical free electron theory – electrical conductivity – Mean free path – Relaxation time and drifty velocity – Quantum free electron theory – Fermi – Dirac (analytical) and its dependence on temperature – Fermi energy – density of states – derivations for current density.

**BAND THEORY OF SOLIDS**: Bloch theorem (qualitative) – Kronig – Penney model – Origin of energy band formation in solids – Classification of

materials into conductors, semi – conductors & insulators – Concepts of effective mass of electron - concept of hole.

**UNIT – VI**

**SEMICONDUCTOR PHYSICS:**

Objective: In the wake of ever increasing demand for the space and power the watch word "small is beautiful", understanding the physics of electronic transport as underlying mechanism for appliances would provide a knowledge base.

Introduction – Intrinsic semiconductor and carrier concentration – Equation for conductivity – Extrinsic semiconductor and carrier concentration – Drift and diffusion – Einstein's equation – Hall Effect – direct & indirect band gap semiconductors – Electronic transport Mechanism for LEDs, Photo conductors and solar cells.

**TEXT BOOKS**

1. Solid state Physics by A.J. Dekker (Mc Millan India Ltd.)
2. A text book of Engineering Physics by M.N. Avadhanulu & P.G. Kshirasagar (S. Chand publications).
3. Engineering Physics b;y M.R. Srinivasan (New Age international publishers).

**REFERENCE BOOKS**

1. 'Introduction to solid state physics' by Charles Kittle (Willey India Pvt.Ltd)
2. 'Applied Physics' by T. Bhimasenkaram (BSP BH Publications )
3. 'Applied Physics' by M.Arumugam (Anuradha Agencies)
4. 'Engineering Physics' by Palanisamy (Scitech Publishers )
5. 'Engineering Physics' by D.K.Bhattacharya ( Oxford University press).
6. 'Engineering Physics' by Mani Naidu S (Pearson Publications).
7. 'Engineering Physics' by Sanjay D Jain and Girish G Sahasrabudhe (University Press).
8. 'Engineering Physics' by B.K.Pandey & S. Chaturvedi (Cengage Learning).

**I Year – II SEMESTER**

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## Professional Ethics and Human Values

**UNIT I : Human Values**:

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

**UNIT II : Engineering Ethics:**

The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy –Professional and Professionalism –Professional Roles to be played by an Engineer –Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics-Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma.

**UNIT III : Engineering as Social Experimentation:**

Comparison with Standard Experiments – Knowledge gained – Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering.

**UNIT IV : Engineers' Responsibility for Safety and Risk:**

Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences- Expected Probability- Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

**UNIT V : Engineers' Responsibilities and Rights:**

Collegiality-Techniques for Achieving Collegiality –Two Senses of Loyalty-obligations of Loyalty-misguided Loyalty – professionalism and Loyalty-Professional Rights –Professional Responsibilities – confidential and proprietary information-Conflict of Interest-solving conflict problems – Self-interest, Customs and Religion- Ethical egoism-Collective bargaining-Confidentiality-Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational Crimes-industrial espionage-price fixing-endangering lives-Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing.

**UNIT VI : Global Issues:**

Globalization- Cross-culture Issues-Environmental Ethics-Computer Ethics-computers as the instrument of Unethical behaviour-computers as the object of Unethical Acts-autonomous computers-computer codes of Ethics-Weapons Development-Ethics and Research-Analysing Ethical Problems in Research-Intellectual Property Rights.

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**Text Books:**

1. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S. SenthilKumar-PHI Learning Pvt. Ltd-2009.
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications.
4. "Professional Ethics and Human Values" by Prof. D.R. Kiran-
5. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.
6. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata Mc Graw-Hill – 2003.
7. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

**I Year – II SEMESTER**

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## ENGINEERING DRAWING

**Objective**: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

### UNIT I

**Objective :** The objective is to introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.
Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.

### UNIT II

**Objective :** The objective is to introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.
Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.

### UNIT III

**Objective :** The objective is to make the students draw the projections of the lines inclined to both the planes.
Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

### UNIT IV

**Objective :** The objective is to make the students draw the projections of the plane inclined toboth the planes.
Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

### UNIT V

**Objective :** The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

**UNIT VI**

**Objective :** The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**TEXT BOOKS:**

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers

**REFERENCE BOOKS:**

1. Engineering Graphics for Degree by K.C. John, PHI Publishers.
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers.
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age.

**I Year – II SEMESTER**

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## ENGLISH – COMMUNICATION SKILLS LAB – II

**Suggested Lab Manuals:**

**OBJECTIVE:** To impart to the learner the skills of grammar as well as communication through listening, speaking, reading, and writing including soft, that is life skills.

**ADVANCED COMMUNICATION SKILLS**

| | |
|---|---|
| UNIT 6 | Body language |
| UNIT 7 | Dialogues |
| UNIT 8 | Interviews and Telephonic Interviews |
| UNIT 9 | Group Discussions |
| UNIT 10 | Presentation Skills |
| UNIT 11 | Debates |

**Text Book:**

'Strengthen your Communication Skills' Part-B by Maruthi Publications

**Reference Books:**

1. INFOTECH English (Maruthi Publications).
2. Personality Development and Soft Skills (Oxford University Press, New Delhi).

**I Year – II SEMESTER**

| T | P | C |
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## ENGINEERING PHYSICS LAB

**List of Experiments**

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings –Radius of Curvature of Plano_Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of stretched string – Sonometer.
8. Determination of velocity of sound – Volume resonator.
9. L C R Senes Resonance Circuit
10. Study of I/V Characteristics of Semiconductor diode
11. I/V characteristics of Zener diode
12. Thermistor characteristics – Temperature Coefficient.
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p.n junction.
15. Hall Effect for semiconductor.

**REFERENCE:**

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links).
2. Physics practical manual, Lorven Publications.

**I Year – II SEMESTER**

| T | P | C |
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**Engineering Physics**
**Virtual Labs - Assignments**

**List of Experiments**

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size

URL : WWW.vlab.co.in

**I Year – II SEMESTER**

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## ENGINEERING WORKSHOP & IT WORKSHOP

**ENGINEERING WORKSHOP:**

**Course Objective :** To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

**Trade:**

**Carpentry**
1. T-Lap Joint
2 Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

**Fitting**
1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

**Black Smithy**
1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

**House Wiring**
1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

**Tin Smithy**
1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

**IT WORKSHOP:**

**Objectives:** Enabling the student to understand basic hardware and software tools through practical exposure.

**PC Hardware:**

Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers. Troubleshooting Hardware and software _ some tips and tricks.

**Internet & World Wide Web:**

Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email,

newsgroups and discussion forums .Awareness of cyber hygiene( protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.

**Productivity tools** Crafting professional word documents; excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools.

**(Note: Student should be thoroughly exposed to minimum of 12 Tasks)**

**PC Hardware**

**Task 1:Identification of the peripherals of a computer.**
To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.

**Task 2(Optional) :**A practice on disassembling the components of a PC and assembling them to back to working condition.

**Task 3:** Examples of Operating systems- DOS, MS Windows,Installation of MS windows on a PC.

**Task 4:** Introduction to Memory and Storage Devices , I/O Port, Device Drivers, Assemblers, Compilers, Interpreters , Linkers, Loaders.

**Task 5:**

**Hardware Troubleshooting (Demonstration):**

Identification of a problem and fixing a defective PC(improper assembly or defective peripherals).

**Software Troubleshooting (Demonstration):**. Identification of a problem and fixing the PC for any software issues.

**Internet & Networking Infrastructure**

**Task 6**: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC ,Bluetooth Technology, Wireless Technology, Modem, DSL, Dialup Connection.

**Orientation & Connectivity Boot Camp and web browsing:** Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

**Task 7**: **Search Engines & Netiquette:**

Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc). Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.

**Task 8: Cyber Hygiene (Demonstration):** Awareness of various threats on the internet. Importance of security patch updates and anti-virus solutions. Ethical Hacking, Firewalls, Multi-factor authentication techniques including Smartcard, Biometrics are also practiced.

**Word**

**Task 9 : MS Word Orientation:**

Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.

**Task 10: Creating project :** Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

**Excel**

**Task 11:** Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.

**Creating a Scheduler -** Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text.

**LOOKUP/VLOOKUP**

**Task 12: Performance Analysis** - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

**Power Point**

**Task 13:** Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in Powerpoint.

**Task 14:** Focusing on the power and potential of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter,

notes etc), Inserting – Background, textures, Design Templates, Hidden slides, OLE in PPT.

**TEXT BOOK:**

**Faculty to consolidate the workshop manuals using the following references**

1. Computer Fundamentals, Anita Goel, Pearson.
2. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008.
3. Information Technology Workshop,3e, G Praveen Babu, M V Narayana BS Publications.
4. Comdex Information Technology , Vikas Gupta, dreamtech.

**REFERENCE BOOK:**

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu.
2. PC Hardware trouble shooting made easy, TMH.

**II Year – I SEMESTER**

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## BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

**Preamble:**

This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

**Learning Objectives:**

i. To learn the basic principles of electrical law's and analysis of networks.
ii. To understand the principle of operation and construction details of DC machines.
iii. To understand the principle of operation and construction details of transformer.
iv. To understand the principle of operation and construction details of alternator and 3-Phase induction motor.
v. To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
vi. To learn the operation of PNP and NPN transistors and various amplifiers.

**UNIT - I**

**ELECTRICAL CIRCUITS:** Basic definitions, Types of network elements, Ohm's Law, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits and star-delta and delta-star transformations.

**UNIT - II**

**DC MACHINES :**Principle of operation of DC generator – emf equation - types – DC motor types –torque equation – applications – three point starter, swinburn's Test, speed control methods.

**UNIT - III**

**TRANSFORMERS:** Principle of operation of single phase transformers – e.m.f equation – losses –efficiency and regulation.

**UNIT - IV**

**AC MACHINES:** Principle of operation of alternators – regulation by synchronous impedance method –principle of operation of 3-Phase induction motor – slip-torque characteristics - efficiency – applications.

**UNIT V**

**RECTIFIERS & LINEAR ICs:** PN junction diodes, diode applications (Half wave and bridge rectifiers). Characteristicsof operation amplifiers (OP-AMP) - application of OP-AMPs (inverting, non inverting, integrator and differentiator).

**UNIT VI**

**TRANSISTORS:** PNP and NPN junction transistor, transistor as an amplifier, single stage CE Amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

**Outcomes:**

i. Able to analyse the various electrical networks.
ii. Able to understand the operation of DC generators,3-point starter and conduct the Swinburne's Test.
iii. Able to analyse the performance of transformer.
iv. Able to explain the operation of 3-phase alternator and 3-phase induction motors.
v. Able to analyse the operation of half wave, full wave rectifiers and OP-AMPs.
vi. Able to explain the single stage CE amplifier and concept of feedback amplifier.

**TEXT BOOKS**:

1. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group

**REFERENCE BOOKS**:

1. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications.
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition.
3. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition.
4. Industrial Electronics by G.K. Mittal, PHI.

**II Year – I SEMESTER**

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## PROBABILITY AND STATISTICS
**(Common to CE, CSE, IT, Chemical, PE, PCE, Civil Branches)**

**UNIT I Random variables and Distributions:**

Introduction- Random variables- Distribution function- Discrete distributions (Review of Binomial and Poisson distributions)

Continuous distributions: Normal, Normal approximation to Binomial distribution, Gamma and Weibull distributions.

Subject Category

ABET Learning Objectives a b e k

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT II Moments and Generating functions:**

Introduction-Mathematical expectation and properties - Moment generating function - Moments of standard distributions ( Binomial, Poisson and Normal distributions) – Properties.

Subject Category

ABET Learning Objectives a e

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT III Sampling Theory:**

Introduction - Population and samples- Sampling distribution of mean for large and small samples (with known and unknown variance) - Proportion sums and differences of means -Sampling distribution of variance -Point and interval estimators for means and proportions.

Subject Category

ABET Learning Objectives a e k

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E

**UNIT IV Tests of Hypothesis:**

Introduction - Type I and Type II errors - Maximum error - One tail, two-tail tests- Tests concerning one mean and proportion, two means- Proportions

and their differences using Z-test, Student's t-test - F-test and Chi -square test - ANOVA for one-way and two-way classified data.

Subject Category

ABET Learning Objectives a b d e h k

ABET internal assessments 1 2 6 7 10

JNTUK External Evaluation A B D E F

**UNIT V Curve fitting and Correlation:**

Introduction - Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

Simple Correlation and Regression - Rank correlation - Multiple regression

Subject Category

ABET Learning Objectives a d e h k

ABET internal assessments 1 2 6 10

JNTUK External Evaluation A B E

**UNIT VI Statistical Quality Control Methods:**

Introduction - Methods for preparing control charts – Problems using x-bar, p, R charts and attribute charts

Subject Category

ABET Learning Objectives a e k

ABET internal assessments 1 2 6

JNTUK External Evaluation A B E F

**Books:**

1. Probability and Statistics for Engineers: Miller and John E. Freund, Prentice Hall of India.
2. Probability and Statistics for Engineers and Scientists: Ronald E. Walpole, Sharon L. Mayers and Keying Ye: Pearson.
3. Probability, Statistics and Random Processes, Murugesan, Anuradha Publishers, Chenai.

| Subject Category | ABET Learning Objectives | ABET Internal Assessments | JNTUK External Evaluation | Remarks |
|---|---|---|---|---|
| Theory<br>Design<br>Analysis<br>Algorithms<br>Drawing<br>Others | a) Apply knowledge of math, science, & engineering<br>b) Design & conduct experiments, analyze & interpret data<br>c) Design a system/process to meet desired needs within economic, social, political, ethical, health/safety, manufacturability, & sustainability constraints<br>d) Function on multidisciplinary teams<br>e) Identify, formulate, & solve engineering problems<br>f) Understand professional & ethical responsibilities<br>g) Communicate effectively<br>h) Understand impact of engineering solutions in global, | 1. Objective tests<br>2. Essay questions tests<br>3. Peer tutoring based<br>4. Simulation based<br>5. Design oriented<br>6. Problem based<br>7. Experiential (project based) based<br>8. Lab work or field work based<br>9. Presentation based<br>10. Case Studies based<br>11. Role-play based<br>12. Portfolio based | A. Questions should have:<br>B. Definitions, Principle of operation or philosophy of concept.<br>C. Mathematical treatment, derivations, analysis, synthesis, numerical problems with inference.<br>D. Design oriented problems<br>E. Trouble shooting type of questions<br>F. Applications related questions<br>G. Brain storming questions | |

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| | economic, environmental, & societal context<br>i) Recognize need for & be able to engage in lifelong learning<br>j) Know contemporary issues<br>k) Use techniques, skills, modern tools for engineering practices | | | |

**II Year – I SEMESTER**

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## STRENGTH OF MATERIALS-I

**Course Learning Objectives:**

1. To give preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress strain behavior of materials and their governing laws. Introduce student the moduli of Elasticity and their relations.
2. To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions and to draw the diagrams of variation across the length.
3. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
4. The concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
5. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

**Course Outcomes:**

1. The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions.
2. The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces.
3. The student will have knowledge of bending concepts and calculation of section modulus and for determination of stressed developed in the beans due to various loading conditions.
4. The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure.

**Syllabus :**

**UNIT – I: SIMPLE STRESSES AND STRAINS and STRAIN ENERGY:** Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of

safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

**STRAIN ENERGY** – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

**UNIT – II:**

**SHEAR FORCE AND BENDING MOMENT:** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

**UNIT – III:**

**FLEXURAL STRESSES:** Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

**UNIT –IV:**

**SHEAR STRESSES:** Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections, built up beams, shear centre.

**UNIT – V:**

**DEFLECTION OF BEAMS:** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. Uniformly varying load.-Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

**UNIT – VI:**

**THIN AND THICK CYLINDERS:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.

**THICK CYLINDERS:** Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses

across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

**TEXT BOOKS:**

Strength of Materials by S. S. Bhavakatti

**REFERENCES:**

1. Strength of Materials by S.S. Rattan, Tata McGraw Hill Education Pvt., Ltd.,
2. Strength of materials by R.K. Rajput, S. Chand & Co, New Delhi

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**II Year – I SEMESTER**

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## BUILDING MATERIALS AND CONSTRUCTION

### UNIT.I : STONES, BRICKS AND TILES

Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials – their quality.

### UNIT. II MASONRY

Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry.Cavity and partition walls.

WOOD: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiver – Reinforced Plastics, Steel, Aluminium.

### UNIT. III: LIME AND CEMENT

Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime.

Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties.Various field and laboratory tests for Cement.Various ingredients of cement concrete and their importance – various tests for concrete.

### UNIT. IV:BUILDING COMPONENTS

Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.

### UNIT.V : FINISHINGS

Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering –

Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish.

Form Works and Scaffoldings.

**UNIT. VI: AGGEGATES**

Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.

**TEXT BOOKS:**

1. Building Materials by S.S. Bhavikatti, Vices publications House private ltd.
2. Building Construction by S.S. Bhavikatti, Vices publications House private ltd.
3. Building Materials by B.C. Punmia, Laxmi Publications private ltd.
4. Building Construction by B.C. Punmia, Laxmi Publications (p) ltd.

**References:**

1. Building Materials by S.K.Duggal, New Age International Publications.
2. Building Materials by P.C.Verghese, PHI learning (P) ltd.
3. Building Materials by M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction by P.C.Verghese, PHI Learning (P) Ltd.

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**II Year – I SEMESTER**

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## SURVEYING

**Course Learning Objectives:**

To introduce the students to basic principles of surveying, various methods of linear and angles measuring instruments and enable the students to use surveying equipments.

**Course Outcomes:**

Upon successful completion of the course, the student will be able:

- To demonstrate the basic surveying skills
- To use various surveying instruments.
- To perform different methods of surveying
- To compute various data required for various methods of surveying.
- To integrate the knowledge and produce topographical map.

**Syllabus :**

**UNIT – I**

**INTRODUCTION:** definition-Uses of surveying- overview of plane surveying (chain, compass and plane table), Objectives, Principles and classifications – Errors in survey measurements

**UNIT – II**

**DISTANCES AND DIRECTION:** Distance measurement conventions and methods; use of chain and tape, Electronic distance measurements (EDM)-principles of of electro optical EDM-errors and corrections to linear measurements - compass survey - Meridians, Azimuths and Bearings, declination, computation of angle.

Traversing - Purpose-types of traverse-traverse computation - traverse adjustments - omitted measurements.

**UNIT – III**

**LEVELING AND CONTOURING:** Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. Characteristics and Uses of contours- methods of conducting contour surveys and their plotting.

**UNIT – IV**

**THEODOLITE:** Theodolite, description, principles-uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite - Trigonometrical leveling,.

**TACHEOMETRIC SURVEYING:** Stadia and tangential methods of Tacheometry. Distance and Elevation formulae for Staff vertical position.

**UNIT – V**

**Curves:** Types of curves, design and setting out – simple and compound curves- transition curves. Introduction to geodetic surveying, Total Station and Global positioning system.

**UNIT – VI**

**COMPUTATION OF AREAS AND VOLUMES:** Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

**Text books:**

1. Surveying (Vol No.1, 2 &3 ) by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P)ltd, New Delhi.
2. Advance Surveying by Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
3. Text book of Surveying by C. Venkataramaiah, University press, India (P) limited.
4. Surveying and levelling by R. Subramanian, Oxford University press.

**References:**

1. Text book of Surveying by S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Text book of Surveying by Arora (Vol No. 1&2), Standard Book House, Delhi.
3. Higher Surveying by A.M. Chandra, New Age International Pvt ltd.
4. Fundamentals of surveying by S.K. Roy – PHI learning (P) Ltd.
5. Plane Surveying by Alak de, S. Chand & Company, New Delhi.

**II Year – I SEMESTER**

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## FLUID MECHANICS

**UNIT I**

**INTRODUCTION :** Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

**UNTI – II**

**HYDROSTATICS:** Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems.

**FLUID KINEMATICS:** Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

**UNIT – III**

**FLUID DYNAMICS:** Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Navier – Stokes equations (Explanationary) Momentum equation and its application – forces on pipe bend.

**UNIT – IV**

**BOUNDARY LAYER THEORY**: Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers, no deviations BL in transition, separation of BL, Control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

**UNIT – V**

**LAMINAR FLOW**: Reynold's experiment – Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

**CLOSED CONDUIT FLOW:** Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and

hydraulic gradient line.Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart.

**UNIT – VI**

**MEASUREMENT OF FLOW:** Pitot tube, Venturi meter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular and trapezoidal and Stepped notches - –Broad crested weirs.

**TEXT BOOKS:**

1. Fluid Mechanics by Modi and Seth, TEXT BOOKS house.
2. Introduction to Fluid Machines by S.K. Som & G. Biswas, Tata Mc Graw Hill Pvt. Ltd.
3. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) Ltd., New Delhi

**REFERENCES:**

1. Fluid Mechanics by Merie C. potter and David C. Wiggert, Cengage learning
2. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi
3. Fluid Mechanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi

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**II Year – I SEMESTER**

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## SURVEYING FIELD WORK-I

**List of Field Works:**

1. Survey by chain survey of road profile with offsets in case of road widening .
2. Survey in an area by chain survey (Closed circuit).
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse).
5. Plane table survey : finding the area of a given boundary by the method of Radiation.
6. Plane table survey : finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling : Height of the instrument method (differential levelling) .
9. Fly levelling : rise and fall method.
10. Fly levelling : closed circuit/ open circuit.
11. Fly levelling : Longitudinal Section and Cross sections of a given road profile.

**Note: Any 10 field work assignments must be completed.**

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**II Year – I SEMESTER**

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## STRENGTH OF MATERIALS LAB

**List of Experiments**

1. Tension test on Steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – deflection test.

**List of Major Equipment:**

1. UTM for conducting tension test on rods
2. Steel beam for flexure test
3. Wooden beam for flexure test
4. Torsion testing machine
5. Brinnell's / Rock well's hardness testing machine
6. Setup for spring tests
7. Compression testing machine
8. Izod Impact machine
9. Shear testing machine
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup
12. Electrical Resistance gauges.

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**II Year – II SEMESTER**

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## BUILDING PLANNING & DRAWING

**UNIT. I:**

**BUILDING BYELAWS AND REGULATIONS**

Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

**UNIT. II:**

**RESIDENTIAL BUILDINGS**

Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types residential buildings.

**UNIT. III:**

**PUBLIC BUILDINGS**

Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

**UNIT.IV :**

**SIGN CONVENTIONS AND BONDS**

Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminium alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles.

English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

**UNIT.V:**

**DOORS, WINDOWS, VENTILATORS AND ROOFS**

Panelled door, panelled and glassed door, glassed windows, panelled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs.

King Post truss, Queen Post truss

Sloped and flat roof buildings : drawing plans, Elevations and Cross Sections of given sloped roof buildings.

**UNIT. VI:**

**PLANNING AND DESIGNING OF BUILDINGS**

Draw the Plan, Elevation and sections of a Residential & Public buildings from the given line diagram.

**TEXT BOOKS:**

1. Planning and Design of buildings by Y.S. Sane
2. Planning, designing and Scheduling by Gurucharan Singh and Jagadish Singh
3. Building planning and drawing by M. Chakravarthi.
4. 3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

**REFERENCES:**

1. Building drawing by Shah and Kale

**INTERNAL EXAMINATION PATTERN:**

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. Part A consist of five questions in planning portion out of which three questions are to be answered. Part B should consist of two questions from drawing part out of which one is to be answered in drawing sheet. Weight age for Part – A is 60% and Part- B is 40%.

**II Year – II SEMESTER**

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## MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

**Unit – I: (*The Learning objective of this Unit is to understand the concept and nature of Managerial Economic s and its relationship with other disciplines, Concept of Demand and Demand forecasting)**

**Introduction to Managerial Economics and demand Analysis:**

Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Concepts of Demand-Types-Determents-Law of Demand its Exception-Elasticity of Demand-Types and Measurement-Demand forecasting and its Methods.

(**The Learner is equipped with the knowledge of estimating the Demand for a product and the relationship between Price and Demand).

**Unit – II: (*The Learning objective of this Unit is to understand the concept of Production function, Input Output relationship, different Cost Concepts and Concept of Cost-Volume-Profit Analysis)**

**Production and Cost Analyses:**

Production function-Isoquants and Isocosts-Law of Variable proportions-Cobb-Douglas Production function-Economics of Sale-Cost Concepts-Opportunity Cost-Fixed vs Variable Costs-Explicit Costs vs Implicit Costs-Out of Pocket Costs vs Imputed Costs-Cost Volume Profit analysis-Determination of Break-Even Point (Simple Problem)

(**One should understand the Cost Concepts for decision making and to estimate the least cost combination of inputs).

**Unit – III: (*The Learning Objective of this Unit is t understand the Nature of Competition, Characteristics of Pricing in the different market structure and significance of various pricing methods)**

**Introduction to Markets, Theories of the Firm & Pricing Policies:**

Market Structures: Perfect Competition, Monopoly and Monopolistic and Oligopoly – Features – Price, Output Determination – Managerial Theories of firm: Maris and Williamson's models – Methods of Pricing: Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive, Transaction based pricing, Priority Pricing.

(** One has to understand the nature of different markets and Price Output determination under various market conditions).

**Unit – IV: (*The Learning objective of this Unit is to know the different forms of Business organization and their Merits and Demerits both public & private Enterprises and the concepts of Business Cycles)**

**Types of Business Organization and Business Cycles:**
Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle.

(**One should equipped with the knowledge of different Business Units)

**Unit – V: (*The Learning objective of this Unit is to understand the different Accounting Systems preparation of Financial Statements and uses of different tools for performance evaluation)**

**Introduction to Accounting & Financing Analysis:**
Introduction to Double Entry Systems – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow cash flow statements (Simple Problems)
(**The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis)

**Unit – VI:** (*The Learning objective of this Unit is to understand the concept of Capital, Capitalization, Capital Budgeting and to know the techniques used to evaluate Capital Budgeting proposals by using different methods).

**Capital and Capital Budgeting:** Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Need for Capital Budgeting-Techniques of Capital Budgeting-Traditional and Modern Methods.
(**The Learner is able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making).

Note: *Learning Objective
** Learning Assessment

**TEXT BOOKS**

1. Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011
3. Prof. J.V.Prabhakara rao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis', Ravindra Publication.

**REFERENCES:**

1. V. Maheswari : Managerial Economics, Sultan Chand.
2. Suma Damodaran : Managerial Economics, Oxford 2011.
3. Dr. B. Kuberudu and Dr. T. V. Ramana : Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.
4. Vanitha Agarwal: Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja : Financial Accounting for Managers, Pearson.
6. Maheswari: Financial Accounting, Vikas Publications.
7. S. A. Siddiqui & A. S. Siddiqui : Managerial Economics and Financial Analysis, New Age International Publishers, 2012.

**II Year – II SEMESTER**

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## STRENGTH OF MATERIALS- II

**Course Learning Objectives:**

1. To give preliminary concepts of Principal stresses and strains developed in cross section of the beams analytically as well as graphically due to stresses acting on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories.
2. To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.
3. To classify columns and calculation of load carrying capacity using different empirical formulas and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses with different engineering structures.
4. Introduce the concept of unsymmetrical bending in beams Location of neutral axis Deflection of beams under unsymmetrical bending.
5. Impart concepts for determination of Forces in members of plane, pin-jointed, perfect trusses by different methods.

**Course Outcomes:**

Upon successful completion of this course

1. The student will be able to understand the basic concepts of Principal stresses developed when subjected to stresses along different axes and design the sections.
2. The student can asses stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions .
3. The student will be able to assess forces in different types of trusses used in construction.

**Syllabus :**

**UNIT- I**

**PRINCIPAL STRESSES AND STRAINS AND THEORY OF FAILURES:** Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses

accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

**THEORIES OF FAILURES:** Introduction – Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

**UNIT – II**

**TORSION OF CIRCULAR SHAFTS AND SPRINGS:** Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

**SPRINGS:** Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

**UNIT – III**

**COLUMNS AND STRUTS:** Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

Laterally loaded struts – subjected to uniformly distributed and concentrated loads – Maximum B.M. and stress due to transverse and lateral loading.

**UNIT – IV**

**DIRECT AND BENDING STRESSES:** Stresses under the combined action of direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

**UNIT – V**

**UNSYMETRICAL BENDING:** Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis Deflection of beams under unsymmetrical bending.

**UNIT – VI**

**ANALYSIS OF PIN-JOINTED PLANE FRAMES:** Determination of Forces in members of plane, pin-jointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply supported trusses by method of joints, method of sections.

**TEXT BOOKS:**

1. Mechanics of Materials- by R. C. Hibbler
2. Strength of materials by S. S. Bhavakatti

**REFERENCES:**

1. Fundamentals of Solid Mechanics M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.
2. Introduction to text book of Strength of Material by U.C. Jindal, Galgotia publications.
3. Strength of materials by R. Subramanian, Oxford university press, New Delhi.

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**II Year – II SEMESTER**

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## HYDRAULICS AND HYDRAULIC MACHINERY

**UNIT – I**

**OPEN CHANNEL FLOW:** Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; and Bazin formulae for uniform flow – Most Economical sections.

Critical flow : Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows.

**UNIT II**

**OPEN CHANNEL FLOW II:** Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

**UNIT – III**

**HYDRAULIC SIMILITUDE:** Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

**UNIT – IV**

**BASICS OF TURBO MACHINERY:** Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines. Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines.

**UNIT – V**

**HYDRAULIC TURBINES – I:** Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency.

**HYDRAULIC TURBINES – II:** Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation.

**UNIT – VI**

**CENTRAIFUGAL-PUMPS:** Pump installation details-classification-work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel- performance of pumps-characteristic curves- NPSH- Cavitation.

**RECIPROCATING PUMPS:** Introduction, classification of reciprocating pumps, main components of reciprocating pumps, working of a reciprocating pumps, discharge through pumps, indicator diagram, work done by reciprocating pumps, slip of reciprocating pumps.

**TEXT BOOKS:**

1. Open Channel flow by K. Subramanya, Tata McGraw Hill Publishers
2. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) Ltd., New Delhi.
3. Fluid Mechanics by Modi and Seth, TEXT BOOKS house.

**REFERENCES:**

1. Fluid mechanics and fluid machines by Rajput, S. Chand & Co.
2. Hydraulic Machines by Banga & Sharma Khanna Publishers.
3. Fluid Mechanics & Fluid Power Engineering by D.S. Kumar Kataria & Sons.

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**II Year – II SEMESTER**

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## CONCRETE TECHNOLOGY

**Course Learning Objectives:**

- To learn the concepts of Concrete production and its behaviour in various environments.
- To learn the test procedures for the determination of properties of concrete.
- To understand durability properties of concrete in various environments.

**Course Outcomes:**

Upon successful completion of this course, student will be able to

- understand the basic concepts of concrete.
- realise the importance of quality of concrete.
- familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
- test the fresh concrete properties and the hardened concrete properties.
- evaluate the ingredients of concrete through lab test results.
- design the concrete mix by BIS method.
- familiarise the basic concepts of special concrete and their production and applications.
- understand the behaviour of concrete in various environments.

**Syllabus :**

**UNIT I : INGREDIENTS OF CONCRETE**

**CEMENTS & ADMIXTURES:** Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume.

**AGGREGATES:** Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis –

Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size.
Quality of mixing water

**UNIT – II**

**FRESH CONCRETE:** Steps inManufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

**UNIT – III**

**HARDENED CONCRETE:** Water / Cement ratio – Abram's Law – Gelspaoe ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete:Compression tests – Tension tests – Factors affecting strength – Flexure tests –Splitting tests – Non-destructive testing methods – codal provisions for NDT.

**UNIT – IV**

**ELASTICITY, CREEP & SHRINKAGE** – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.

**UNIT – V**

**MIX DESIGN:** Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design.

**UNIT – VI**

**SPECIAL CONCRETES:** Ready mixed concrete, Shotcrete -Light weight aggregate concrete – Cellular concrete – No-fines concrete, High density concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C, Polymer concrete – Types of Polymer concrete – Properties of polymer concrete, High performance concrete – Self consolidating concrete, SIFCON, self healing concrete.

**TEXT BOOKS:**

1. Concrete Technology by M.S.Shetty. – S.Chand & Co.; 2004.
2. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.

**REFERENCES:**

1. Properties of Concrete by A.M.Neville – PEARSON – 4th edition.
2. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi.

**II Year – II SEMESTER**

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## STRUCTURAL ANALYSIS - I

**Course Learning Objectives:**

1. To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
2. To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions and to draw the diagrams of variation across the length.
3. The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.
4. The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans are passing over beams of different spans of Pratt and Warren trusses.

**Course Outcomes:**

Upon successful completion of this course,

1. The student will be able to estimate the bending moment and shear forces in beams of different fixity conditions.
2. The student can analyze the continuous beams using tan important method of slope deflection which impart basic concepts for other methods of analysis to be discussed in next level analysis course.
3. The student will be able to analyze the loads in Pratt and Warren trusses when loads of different types and spans ware passing over the truss. These concepts will be used in to understand the performance and to design of bridge structures in next level courses.

**Syllabus :**

**UNIT – I**

**PROPPED CANTILEVERS:** Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

**UNIT – II**

**FIXED BEAMS** – Introduction to statically indeterminate beams with U. D. load central point load, eccentric point load. Number of point loads, uniformly varying load, couple and combination of loads shear force and Bending moment diagrams-Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

**UNIT – III**

**CONTINUOUS BEAMS:** Introduction-Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and Bending moment diagrams.

**UNIT-IV**

**SLOPE-DEFLECTION METHOD:** Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

**UNIT – V**

**ENERGY THEOREMS:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed trusses.

**UNIT – VI**

**MOVING LOADS and INFLUENCE LINES:** Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.

**INFLUENCE LINES:** Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a sections, ingle point load, U.D. load longer than the span, U.D. load shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

**TEXT BOOKS:**

1. Structural Analysis by V.D. Prasad Galgotia publications, 2nd Editions.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.

**REFERENCES:**

1. Theory of Structures by Gupta, Pandit & Gupta; Tata McGraw Hill, New Delhi.
2. Theory of Structures by R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.

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**II Year – II SEMESTER**

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## FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

**List of Experiments**

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

**List of Equipment:**

1. Venturimeter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal and Reciprocating pumps.

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**II Year – II SEMESTER**

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## CONCRETE TECHNOLOGY LAB

**Course Learning Objectives:**

To test the basic properties ingredients of concrete, fresh and hardened concrete properties.

**Course Outcomes:**

Upon successful completion of this course, student will be able to

- Determine the consistency and fineness of cement.
- Determine the setting times of cement.
- Determine the specific gravity and soundness of cement.
- Determine the compressive strength of cement.
- Determine the workability of cement concrete by compaction factor, slump and Vee – Bee tests
- Determine the specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
- Determine the flakiness and elongation index of aggregates.
- Determine the bulking of sand.
- Understand the non-destructive testing procedures on concrete.

**List of Experiments:**

At least 10 experiments must be conducted ( at least one for each property)

1. Determination of normal Consistency and fineness of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of specific gravity and soundness of cement.
4. Determination of compressive strength of cement.
5. Dtermination of grading and fineness modulus of Coarse aggregate by sieve analysis.
6. Determination of specific gravity of coarse aggregate
7. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.
8. Determination of bulking of sand.
9. Determination of workability of concrete by compaction factor method.

10. Determination of workability of concrete by slump test
11. Determination of workability of concrete by Vee-bee test.
12. Determination of compressive strength of cement concrete and its young's modulus.
13. Determination of split tensile strength of concrete.
14. Non-Destructive testing on concrete (for demonstration)

**List of Equipment:**

1. Standard set of sieves for coarse aggregate and fine aggregate
2. Vicat's apparatus
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus.
6. Compaction Factor Test Apparatus.
7. Vee- Bee test apparatus
8. Longitudinal compresso meter
9. Universal testing Machine (UTM)/Compression Testing Machine (CTM).
10. Rebound hammer, Ultrasonic pulse velocity machine, micro cover meter etc.

**II Year – II SEMESTER**

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## SURVEYING FIELD WORK- II

**List of Experiments**

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tacheomatric survey: Heights and distance problems using tacheomatric principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station : Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total Station : Determination of area using total station.
9. Total Station : Traversing
10. Total Station : Contouring
11. Total Station : Determination of Remote height.
12. Total Station : distance between two inaccessible points.

**Note:** Any 10 field work assignments must be completed**.**

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**III Year – I SEMESTER**

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## CE 501 - ENGINEERING GEOLOGY

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | 30 Marks |
| Tutorial : | 1 hrs/Week | Semester End Examination : | 70 Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To introduce the Engineering Geology as a subject in Civil Engineering.
2. To enable the student to use subject in civil engineering applications.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. Identify and classify the geological minerals.
b. Measure the rock strengths of various rocks.
c. Classify and measure the earthquake prone areas to practice the hazard zonation.
d. Classify, monitor and measure the Landslides and subsidence.
e. Prepares, analyses and interpret the Engineering Geologic maps
f. Analyses the ground conditions through geophysical surveys.
g. Test the geological material and ground to check the suitability of civil engineering project construction.
h. Investigate the project site for mega/mini civil engineering projects.Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc…

**SYLLABUS:**

**UNIT-I:**

**Introduction:** Branches of Geology, Importance of Geology in Civil Engineering with case studies.

**Weathering:**Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

**UNIT-II**

**Mineralogy And Petrology:** Definitions of mineral and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite And Bauxite. Classification, structures ,textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

**UNIT-III**

**Structural Geology:** Strike , Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

**UNIT-IV**

**Ground Water:**Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.

**Earthquakes And Land Slides:** Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Land slides.

**UNIT-V**

**Geophysics:** Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

**UNIT-VI**

**Geology Of Dams, Reservoirs And Tunnels:** Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

**TEXT BOOKS:**

1. ‘Engineering Geology’ by Subinoy Gangopadhay, Oxford University press.
2. ‘Engineering Geology’ by D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
3. ‘Engineering Geology’ by N. Chenn Kesavulu, Trinity Press (Laxmi Publications), 2nd Edition, 2014.
4. ‘Engineering Geology’ by Vasudev Kanithi, University Press.

**REFERENCES:**

1. ‘Engineering Geology for Civil Engineers’ by P.C. Varghese,PHI learning pvt. Ltd.
2. ‘Geology for Engineers and Environmental Society’ by Alan E Kehew, person publications, 3rd edition
3. ‘Fundamentals of Engineering Geology’ by P.G. Bell, B.S.P. Publications, 2012.
4. ‘Engineering Geology’ by V.Parthesarathi et al., Wiley Publications
5. ‘Environmental Geology’ by K.S. Valdiya, McGraw Hill Publications, 2nd ed.

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**III Year – I SEMESTER**

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## CE502 - STRUCTURAL ANALYSIS – II

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|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with Different types of Structures
2. Equip student with concepts of Arches
3. Understand Concepts of lateral Load analysis
4. Familiarize Cables and Suspension Bridges
5. Understand Analysis methods Moment Distribution, Kanis Method and Matrix methods.

**Course Outcomes**:

At the end of this course; the student will be able to

a. Differentiate Determinate and Indeterminate Structures
b. Carryout lateral Load analysis of structures
c. Analyze Cable and Suspension Bridge structures
d. Analyze structures using Moment Distribution, Kani's Method and Matrix methods.

**SYLLABUS:**

**UNIT I**

**Three Hinged Arches:** Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature.

**Two Hinged Arches:**Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, tied arches – fixed arches – ( No analytical question).

**UNIT-II**

**Lateral Load Analysis Using Approximate Methods**: application to building frames. (i) Portal method (ii) Cantilever method.

**UNIT – III**

**Cable Structures And Suspension Bridges**: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

**UNIT – IV**

**Moment Distribution Method**: Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway-Substitute frame analysis by two cycle.

**UNIT – V**

**Kani's Method**: Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway.

**UNI – VI**

**Introduction to Matrix Methods:**

Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

**TEXT BOOKS:**

1. 'Structural Analysis' by T.S.Thandavamoorthy, Oxford university press, India.
2. 'Structural Analysis' by R.C. Hibbeler, Pearson Education, India
3. 'Theory of Structures – II' by B.C.Punmia, Jain & Jain, Laxmi Publications, India.
4. 'Structural Analysis' by C.S. Reddy, Tata Mc-Graw hill, New Delhi.

**REFERENCES:**

1. 'Intermediate Structural Analysis' by C. K. Wang, Tata McGraw Hill, India.
2. 'Theory of structures' by Ramamuratam, Dhanpatrai Publications.
3. 'Analysis of structures' by Vazrani & Ratwani – Khanna Publications.
4. 'Comprehensive Structural Analysis-Vol.I&2' by Dr. R. Vaidyanathan & Dr. P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi.

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**III Year – I SEMESTER**

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## CE503-DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with different types of design philosophies
2. Equip student with concepts of design of flexural members
3. Understand Concepts of shear, bond and torsion
4. Familiarize students with different types of compressions members and Design
5. Understand different types of footings and their design

**Course Outcomes**:

At the end of this course the student will be able to

a. Work on different types of design philosophies
b. Carryout analysis and design of flexural members and detailing
c. Design structures subjected to shear, bond and torsion
d. Design different type of compression members and footings

**SYLLABUS:**

**UNIT –I**

**Introduction:** Working stress method Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly and doubly reinforced beams.

**Limit State Design**: Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

**UNIT –II**

**Design for Flexure:** Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)- Effective width of flange –Behavior- Analysis and Design.

**UNIT – III**

**Design for Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.**Limit state design for serviceability:** Deflection, cracking and code provision, Design of formwork for beams and slabs.

**UNIT – IV**

**Design of Compression members**: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

**UNIT –V**

**Footings:** Different types of footings – Design of isolated and combined footings - rectangular and circular footings subjected to axial loads, uni-axial and bi-axial bending moments.

**UNIT – VI**

**Slabs:** Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

**NOTE:** All the designs to be taught in Limit State Method

Following plates should be prepared by the students.

1. Reinforcement detailing of T-beams, L-beams and continuous beams.
2. Reinforcement detailing of columns and isolated footings.
4. Detailing of one-way, two-way and continuous slabs and waist-slab staircase.

**INTERNAL EXAMINATION PATTERN:**

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

**TEXT BOOKS:**

1. 'Limit State Design' by A. K. Jain
2. 'Design of Reinforced concrete Structures' by N. Subrahmanyian
3. 'Reinforced Concrete Structures' by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.

**REFERENCES:**

1. 'Design of concrete structures'by Arthus H.Nilson, David Darwin, and Chorles W. Dolar, Tata McGrawHill,3rd Edition, 2005.
2. 'Reinforced Concrete Structures' by Park and Pauley, John Wiley and Sons.

**IS Codes:**

1) IS -456-2000 (Permitted to use in examination hall)
2) IS – 875
3) SP-16

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**III Year – I SEMESTER**

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**CE504-GEOTECHNICAL ENGINEERING – I**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To enable the student to determine the index properties of the soil and classify it.
2. To impart the concept of seepage of water through soils and determine the discharge of water through soils.
3. To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
4. To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.

**Course Outcomes**:

Upon the successful completion of this course

a. The student must know the definition of the various quantities related to soil mechanics and establish their inter-relationships.
b. The student should be able to know the methods of determination of the various index properties of the soils and classify the soils.
c. The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory.
d. The student should be able to apply the above concepts in day-to-day civil engineering practice.

**SYLLABUS:**

**UNIT – I**

**Introduction:** Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship –Relative density - Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

**UNIT – II**

**Index Properties Of Soils:** Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

**UNIT –III**

**Permeability:** Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective stresses –quick sand condition – 2-D flow and Laplace's equation - Seepage through soils –Flow nets: Characteristics and Uses.

**UNIT – IV**

**Stress Distribution In Soils:** Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method.

**UNIT – V**

**Consolidation:** Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation ($c_v$) - Over consolidated and normally consolidated clays.

**UNIT - VI**

**Shear Strength of Soils:** Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions.

**TEXT BOOKS:**

1. 'Basic and Applied Soil Mechanics' by Gopal Ranjan and A.S.R.Rao, New Age International Publishers.
2. 'Soil Mechanics and Foundation Engineering' by V.N.S.Murthy ,CBS publishers.
3. 'Soil Mechanics' by M.Palani Kumar, PHI Learning.

**REFERENCES:**

1. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley.
2. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall.

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**III Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

## CE505-TRANSPORTATION ENGINEERING – I

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To impart different concepts in the field of Highway Engineering.
2. To acquire design principles of Highway Geometrics and Pavements
3. To learn various highway construction and maintenance procedures.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. Plan highway network for a given area.
b. Determine Highway alignment and design highway geometrics.
c. Design Intersections and prepare traffic management plans.
d. Judge suitability of pavement materials and design flexible and rigid pavements.
e. Construct and maintain highways

**SYLLABUS:**

**UNIT I**

**Highway Planning and Alignment**:Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

**UNIT – II**

**Highway Geometic Design:**Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of

Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment-Gradients- Vertical curves.

**UNIT – III**

**Traffic Engineering:**Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC Method.

**UNIT – IV**

**Highway Materials:**Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

**UNIT – V**

**Design Of Pavements:**Types of pavements; Functions and requirements of different components of pavements; Design Factors

***Flexible Pavements:*** Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

***Rigid Pavements:*** Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

**UNIT – VI**

**Highway Construction and Maintenance:**Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements.

Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing pavements.

**TEXT BOOKS:**

1. ‘Highway Engineering’by Khanna S.K., Justo C.E.G and Veeraragavan A, Nem Chand Bros, Roorkee.
2. ‘Traffic Engineering and Transportation’ Planning by Kadiyali L.R, Khanna Publishers, New Delhi.
3. ‘Highway Engineering’ by Srinivasa Kumar R, Universities Press, Hyderabad.

**REFERENCES:**

1. ‘Transportation Engineering and Planning’ by Papacostas C.S. and PD Prevedouros, Prentice Hall of India Pvt. Ltd; New Delhi.
2. ‘Principles of Highway Engineering’ by Kadiyali LR, Khanna Publishers, New Delhi.
3. ‘Transportation Engineering - An Introduction’ byJotin Khisty C, Prentice Hall, Englewood Cliffs,New Jersey.
4. ‘Highway Engineering’ by Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi .
5. ‘Principles of Transportation Engineering’ by Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi
6. ‘Practice and Design of Highway Engineering’ by Sharma SK, Principles, S.Chand & Company Private Limited, New Delhi.

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**III Year – I SEMESTER**

| T | P | C |
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| 3+1* | 0 | 2 |

## INTELLECTUAL PROPERTY RIGHTS AND PATENTS

**Unit I**

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

**Unit II**

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

**Unit III**

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

**Unit IV**

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law

**Unit V**

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

**Unit VI**

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime.

**REFERENCE BOOKS:**

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning , New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections
4. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
7. M.Ashok Kumar and Mohd.Iqbal Ali: “Intellectual Property Right” Serials Pub.

**III Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 0 | 0 | 2 |

## CE507-GEOTECHNICAL ENGINEERING LAB

| | | | |
|---|---|---|---|
| Lecture : | -- | Internal Assessment : | 25 Marks |
| Tutorial : | -- | Semester End Examination : | 50 Marks |
| Practical : | 3 hrs/Week | Credits : | 2 |

**Course Learning Objectives:**

The objective of this course is:

1. To impart knowledge of determination of index properties required for classification of soils.
2. To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests; to determine permeability of soils.
3. To teach how to determine shear parameters of soil through different laboratory tests.

**Course Outcomes**:

Upon successful completion of this course, student will be able to

a. Determine index properties of soil and classify them.
b. Determine permeability of soils.
c. Determine Compaction, Consolidation and shear strength characteristics.

**SYLLABUS:**

**LIST OF EXPERIMENTS**

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Hydrometer Analysis Test
6. Permeability of soil - Constant and Variable head tests
7. Compaction test
8. Consolidation test (to be demonstrated)
9. Direct Shear test
10. Triaxial Compression test (UU Test)

11. Unconfined Compression test
12. Vane Shear test
13. Differential free swell (DFS)
14. CBR Test

At least **Ten**experiments shall be conducted.

**LIST OF EQUIPMENT:**

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
   a) Core cutter method
   b) Sand replacement method
4. Set of sieves: 4.75 mm, 2 mm, 1 mm, 0.6 mm, 0.42 mm, 0.3 mm, 0.15 mm, and 0.075 mm.
5. Hydrometer
6. Permeability apparatus for
   a) Constant head test
   b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.
15. Hot air ovens (range of temperature $50^0$ - $150^0$C

**Reference:**

1. 'Determination of Soil Properties' by J. E. Bowles.
2. IS Code 2720 – relevant parts.

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**III Year – I SEMESTER**

| T | P | C |
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## CE508-ENGINEERING GEOLOGY LAB

| | | | |
|---|---|---|---|
| Lecture : | -- | Internal Assessment : | Marks |
| Tutorial : | -- | Semester End Examination : | Marks |
| Practical : | 3 hrs/Week | Credits : | 2 |

**Course Learning Objectives:**

The objective of this course is:

1. To identify the mega-scopic types of Ore minerals & Rock forming minerals.
2. To identify the mega-scopic types of Igneous, Sedimentary, Metamorphic rocks.
3. To identify the topography of the site & material selection

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. Identify Mega-scopic minerals & their properties.
b. Identify Mega-scopic rocks & their properties.
c. Identify the site parameters such as contour, slope & aspect for topography.
d. Know the occurrence of materials using the strike & dip problems.

**SYLLABUS:**

**LIST OF EXPERIMENTS**

1. Physical properties of minerals: Mega-scopic identification of
   a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
   b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc…
2. Megascopic description and identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc…
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc…

c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc…

3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

**LAB EXAMINATION PATTERN:**

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

**REFERENCE:**

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009.

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**III Year – II SEMESTER**

| T | P | C |
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| 3+1* | 0 | 3 |

## CE601-DESIGN AND DRAWING OF STEEL STRUCTURES

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is to:

1. Familiarize Students with different types of Connections and relevant IS codes
2. Equip student with concepts of design of flexural members
3. Understand Design Concepts of tension and compression members in trusses
4. Familiarize students with different types of Columns and column bases and their Design
5. Familiarize students with Plate girder and Gantry Girder and their Design

**Course Outcomes**:

At the end of this course the student will be able to

a. Work with relevant IS codes.
b. Carryout analysis and design of flexural members and detailing.
c. Design compression members of different types with connection detailing.
d. Design Plate Girder and Gantry Girder with connection detailing
e. Produce the drawings pertaining to different components of steel structures.

**SYLLABUS:**

**UNIT – I**

**Connections:** Riveted connections – definition, rivet strength and capacity, Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

**UNIT – II**

**Beams**: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

**UNIT –III**

**Tension Members and compression members:** General Design of members subjected to direct tension and bending –effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc.**Roof Trusses:** Different types of trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

**UNIT – IV**

**Design of Columns:** Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.

**UNIT – V**

**Design of Column Foundations:** Design of slab base and gusseted base. Column bases subjected moment.

**UNIT – VI**

**Design of Plate Girder:** Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

**Design of Gantry Girder:** impact factors - longitudinal forces, Design of Gantry girders.

**NOTE:** Welding connections should be used in Units II – VI.

The students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Compound beams including curtailment of flange plates.

Plate 3 Detailing of Column including lacing and battens.

Plate 4 Detailing of Column bases – slab base and gusseted base

Plate 5 Detailing of steel roof trusses including joint details.

Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

**INTERNAL EXAMINATION PATTERN:**

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

**TEXT BOOKS**

1. 'Steel Structures Design and Practice' by N.Subramanian, Oxford University Press.
2. 'Design of Steel Structures' by Ramachandra, Vol – 1, Universities Press.
3. 'Design of steel structures' by S.K. Duggal, Tata Mcgraw Hill, and New Delhi

**REFERENCES**

1. 'Structural Design in Steel' by Sarwar Alam Raz, New Age International Publishers, New Delhi
2. 'Design of Steel Structures' by P. Dayaratnam; S. Chand Publishers
3. 'Design of Steel Structures' by M. Raghupathi, Tata Mc. Graw-Hill
4. 'Structural Design and Drawing' by N. Krishna Raju; University Press,

**IS Codes:**

1) IS -800 – 2007

2) IS – 875

3) Steel Tables.

These codes and steel tables are permitted to use in the examinations.

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**III Year – II SEMESTER**

| T | P | C |
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| 3+1* | 0 | 3 |

## CE602-GEOTECHNICAL ENGINEERING – II

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To impart to the student knowledge of types of shallow foundations and theories required for the determination of their bearing capacity.
2. To enable the student to compute immediate and consolidation settlements of shallow foundations.
3. To impart the principles of important field tests such as SPT and Plate bearing test.
4. To enable the student to imbibe the concepts of pile foundations and determine their load carrying capacity.

**Course Outcomes**:

Upon the successful completion of this course:

a. The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.
b. The student must be able to compute the magnitude of foundation settlement and decide on the size of the foundation accordingly.
c. The student must be able to use the field test data and arrive at the bearing capacity.
d. The student must be able to apply the principles of bearing capacity of piles and design them accordingly.

**SYLLABUS:**

**UNIT – I**

**Soil Exploration**: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Pressure meter – planning of Programme and preparation of soil investigation report.

**UNIT – II**

**Earth And Earth-Retaining Structures**: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability

analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions.
Rankine's & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils.

**UNIT-III**
**Shallow Foundations – Bearing Capacity Criteria**: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods.

**UNIT-IV**
**Shallow Foundations – Settlement Criteria:** Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures.

**UNIT -V**
**Pile Foundation**: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae– Pile load tests - Load carrying capacity of pile groups in sands and clays.

**UNIT-VI**
**Well Foundations:** Types – Different shapes of well – Components of well – functions – forces acting on well foundations - Design Criteria – Determination of steining thickness and plug - construction and Sinking of wells – Tilt and shift.

**TEXT BOOKS:**

1. 'Principles of Foundation Engineering'by Das, B.M., - (2011) –6th edition (Indian edition) Cengage learning
2. 'Basic and Applied Soil Mechanics' by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd, (2004).

**REFERENCES:**

1. Foundation Analysis and Design'by Bowles, J.E., (1988) – 4th Edition, McGraw-Hill Publishing Company, Newyork.
2. 'Theory and Practice of Foundation Design' by N.N.SOM & S.C.DAS PHI Learning Private limited.

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**III Year – II SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

## CE605-TRANSPORTATION ENGINEERING – II

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To know various components and their functions in a railway track
2. To acquire design principles of geometrics in a railway track.
3. To know various techniques for the effective movement of trains.
4. To acquire design principles of airport geometrics and pavements.
5. To know the planning, construction and maintenance of Docks and Harbours.

**Course Outcomes:**

At the end of course, Student can

a. Design geometrics in a railway track.
b. Provide good transportation network
c. Design airport geometrics and airfield pavements.
d. Plan, construct and maintain Docks and Harbours.

**SYLLABUS:**

**A.RAILWAY ENGINEERING**

**UNIT – I**

**Components of Railway Engineering:**Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

**UNIT – II**

**Geometric Design of Railway Track:**Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve –

Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

**UNIT – III**

**Turnouts & Controllers:**Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing.

Signal Objectives – Classification – Fixed signals – Stop signals – Signalling systems – Mechanical signalling system – Electrical signalling system – System for Controlling Train Movement – Interlocking – Modern signalling Installations.

**B.AIRPORT ENGINEERING**

**UNIT – IV**

**Airport Planning & Design:**Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

**UNIT – V**

**Runway Design:**Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

**C.DOCKS & HARBOURS**

**UNIT – VI**

**Planning, Layout, Construction & Maintenance Of Docks & Harbours:**Classification of ports – Requirement of a good port – classification of Harbours – Docks - Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.

**TEXT BOOKS:**

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora - Nemchand Bros, New Delhi.

3. Docks and Harbour Engineeringby Bindra S.P. - Dhanpathi Rai & Sons, New Delhi.

**REFERENCES:**

1. ‘Railway Engineering’by Saxena & Arora - Dhanpat Rai, New Delhi.
2. ‘Transportation Engineering Planning Design’ by Wright P.H. & Ashfort N.J. - John Wiley & Sons.
3. ‘Airport Engineering’ by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
4. ‘Transportation Engineering’ by Srinivasa Kumar R, University Press, Hyderabad
5. ‘Highway, Railway, Airport and Harbour Engineering’ by Subramanian KP, Scitech Publications (India) Pvt. Limited, Chennai.

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**III Year – II SEMESTER**

| T | P | C |
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| 3+1* | 0 | 3 |

## CE604- ENVIRONMENTAL ENGINEERING – I

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course will address the following:

1. Outline planning and the design of water supply systems for a community/town/city.
2. Provide knowledge of water quality requirement for domestic usage
3. Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
4. Selection of valves and fixture in water distribution systems.
5. Impart knowledge on design of water distribution network.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. Plan and design the water and distribution networks and sewerage systems.
b. Identify the water source and select proper intake structure.
c. Characterisation of water .
d. Select the appropriate appurtenances in the water supply .
e. Selection of suitable treatment flow for raw water treatments.

**SYLLABUS:**

**UNIT–I**

**Introduction**: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities.

**Water Demand and Quantity Estimation**: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting.

**UNIT-II**

**Sources of Water**: Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

**Collection and Conveyance of Water**: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, laying of pipe lines.

**UNIT-III**

**Quality and Analysis of Water**: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sources with reference to quality-I.S. Drinking water quality standards and WHO guidelines for drinking water

**UNIT–IV**

**Treatment of Water**: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration.

**UNIT-V**

**Disinfection**: Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and manganese removal –Adsorption-fluoridation and deflouridation–aeration–Reverse Osmosis-Iron exchange–Ultra filtration.

**UNIT–VI**

**Distribution of Water**: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods -Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, and water meters–Laying and testing of pipe lines- selection of pipe materials, pipe joints.

**TEXT BOOKS**

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.

2. Elements of Environmental Engineering – K.N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

**REFERENCES**

3. Water Supply Engineering – Dr. P.N. Modi
4. Water Supply Engineering – B.C. Punmia
5. Water Supply and Sanitary Engineering – G.S.Birdie and J.S. Birdie
6. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

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**III Year – II SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

## CE603-WATER RESOURCES ENGINEERING–I

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course is designed to

1. Introduce hydrologic cycle and its relevance to Civil engineering.
2. Make the students understand physical processes in hydrology and, components of the hydrologic cycle.
3. Appreciate concepts and theory of physical processes and interactions.
4. Learn measurement and estimation of the components hydrologic cycle.
5. Provide an overview and understanding of Unit Hydrograph theory and its analysis.
6. Understand flood frequency analysis, design flood, flood routing.
7. Appreciate the concepts of groundwater movement and well hydraulics.

**Course Outcomes**

At the end of the course the students are expected to

a. Have a thorough understanding of the theories and principles governing the hydrologic processes.
b. Be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects.
c. Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
d. Be able to develop design storms and carry out frequency analysis.
e. Be able to determine storage capacity and life of reservoirs.
f. Develop unit hydrograph and synthetic hydrograph.
g. Be able to estimate flood magnitude and carry out flood routing.
h. Be able to determine aquifer parameters and yield of wells.
i. Be able to model hydrologic processes.

**SYLLABUS:**

**UNIT I**

**Introduction**: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

**Precipitation**:Types and forms, measurement, raingauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm.

**UNIT-II**

**Abstractions from Precipitation**: Initial abstractions.

**Evaporation**: factors affecting, measurement, reduction

**Evapotranspiration**: factors affecting, measurement, control

**Infiltration**: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

**UNIT-III**

**Runoff :**Catchment characteristics**,** Factors affecting runoff, components, computation- empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

**Hydrograph analysis**: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

**UNIT-IV**

**Floods:** Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

**Flood Routing:** Hydrologic routing, channel and reservoir routing- Muskingum and Puls methods of routing.

**UNIT-V**

**Groundwater:** Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

**UNIT VI**

**Advanced Topics in Hydrology:** Rainfall-runoff Modelling, instantaneous unit hydrograph (IUH) - conceptual models - Clark and Nash models, general hydrological models- Chow - Kulandaiswamy model.

**TEXT BOOKS:**

1. 'Engineering Hydrology' by Subramanya, K, Tata Mc Graw-Hill Education Pvt. Ltd, (2013), New Delhi.
2. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
3. 'Applied hydrology'by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt. Ltd., (2011), New Delhi.
4. 'Engineering Hydrology'by Ojha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press, (2010).

**REFERENCES:**

1. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2. 'Hydrology'by Raghunath. H.M., New Age International Publishers, (2010).
3. 'Engineering Hydrology –Principles and Practice'by Ponce V.M., Prentice Hall International, (1994).
4. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011).

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**III Year – II SEMESTER**

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| 3+1* | 0 | 3 |

**(Open Elective)**

## CE606 ( a ) - ENVIRONMENTAL POLLUTION AND CONTROL

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Impart knowledge on fundamental aspects of air pollution & control, noise pollution, and solid waste management.
2. Provide basic knowledge on sustainable development.
3. Introduces some basics of sanitation methods essential for protection of community health.
4. Differentiate the solid and hazardous waste based on characterization.

**Course Learning Outcomes**:

By the end of successful completion of this course, the students will be able to:

a. Identify the air pollutant control devices
b. Have knowledge on the NAAQ standards and air emission standards
c. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
d. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
e. Appreciate the methods of environmental sanitation and the management of community facilities without spread of epidemics.
f. Appreciate the importance of sustainable development while planning a project or executing an activity.

**SYLLABUS:**

**UNIT – I**

**Air Pollution**: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.

**Noise Pollution**: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

**UNIT –II**

**Industrial wastewater Management**: – Strategies for pollution control - Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants - Recirculation of industrial wastes – Effluent standards.

**UNIT – III**

**Solid Waste Management**: solid waste characteristics – basics of on-site handling and collection – separation and processing - Incineration-Composting-Solid waste disposal methods – fundamentals of Land filling.

**UNIT – IV**

**Environmental Sanitation**: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

**UNIT – V**

**Hazardous Waste:** Characterization - Nuclear waste – Biomedical wastes – Electronic wastes - Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

**UNIT- VI**

**Sustainable Development**: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development.

**TEXT BOOKS:**

1. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.
2. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
3. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing.

**REFERENCES:**


1. Air Pollution and Control by M.N. Rao & H.N. Rao
2. Solid Waste Management by K. Sasi Kumar, S.A. Gopi Krishna. PHI New Delhi.
3. Environmental Engineering by Gerard Kiley, Tata McGraw Hill.
4. Environmental Sanitation by KVSG Murali Krishna, Reem Publications, New Delhi.
5. Industrial Water Pollution Control by Nemerow Jr., McGraw Hill Publishing.
6. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard – Cengage Learning.
7. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
8. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.


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## CE606 ( b ) - DISASTER MANAGEMENT

**(Open Elective)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
2. Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. Affirm the usefulness of integrating management principles in disaster mitigation work
b. Distinguish between the different approaches needed to manage pre-during and post- disaster periods
c. Explain the process of risk management
d. Relate to risk transfer

**SYLLABUS:**

**UNIT-I**

**Natural Hazards And Disaster Management:** Introduction of DM – Inter disciplinary -nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: floods, draughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides.

**UNIT-III**

**Man Made Disastar And Their Management Along With Case Study Methods Of The Following:** Fire hazards – transport hazard dynamics –

solid waste management – post disaster – bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

**UNIT-III**

**Risk And Vulnerability:** Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.

**UNIT-IV**

**Role Of Technology In Disaster Managements**: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes –flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training-transformable indigenous knowledge in disaster reduction.

**UNIT-V**

**Education And Community Preparedness:** Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

**UNIT-VI**

**Multi-sectional Issues:** Impact of disaster on poverty and deprivation-Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction.-Institutional capacity in disaster management -The Red cross and red crescent movement.-Corporate sector and disaster risk reduction-A community focused approach.

**TEXT BOOKS:**

1. 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy(2009),Universities press.
2. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. 'Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

**REFERENCE BOOKS:**

1. 'Disaster Management' edited by H K Gupta (2003),Universities press.

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## CE606 ( c ) -INDUSTRIAL WATER & WASTE WATER MANAGEMENT

**(Open Elective)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course will address the following:

1. Enables the student to distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
2. To impart knowledge on selection of treatment methods for industrial wasteswater.
3. To know the common methods of treatment in different industries.
4. To acquire knowledge on operational problems of common effluent treatment plant.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. Suggest treatment methods for any industrial wastewater.
b. Learn the manufacturing process of various industries.
c. Student will be in a position to decide the need of common effluent treatment plant for the industrial area in their vicinity.

**SYLLABUS:**

**UNIT – I**

**Industrial water Quantity and Quality requirements**: Boiler and cooling waters–Process water for Textiles, Food processing, Brewery Industries, power plants, fertilizers, sugar mills.

**UNIT – II**

**Miscellaneous Treatment**: Use of Municipal wastewater in Industries – Advanced water treatment - Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour.

**UNIT – III**

**Basic theories of Industrial Wastewater Management:** Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis -

Wastewater characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-Volume and Strength reduction – Neutralization – Equalization and proportioning- recycling, reuse and resources recovery.

**UNIT – IV**

**Industrial wastewater disposal management**: discharges into Streams, Lakes and oceans and associated problems, Land treatment - Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastes- Effluent Disposal Method.

**UNIT – V**

**Process and Treatment of specific Industries-1:** Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants.

**UNIT – VI**

**Process and Treatment of specific Industries-2:** Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Pharmaceutical Plants.

**Text book**

1. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi.
2. Industrial Wastewater Treatment by KVSG Murali Krishna.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning, Delhi.
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rd Edition.

**References**

1. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc-GrawHill, Third Edition
2. Wastewater Engineering by Metcalf and Eddy Inc., Tata McGrawhill Co., New Delhi
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall of India.
4. Unit Operations and Processes in Environmental Engineering by Reynolds. Richard, Cengage Learning.

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## CE606 ( d ) - ARCHITECTURE AND TOWN PLANNING

**(Open Elective)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Initiating the students to different architectures of the world. The distinctions between the eastern and western architecture styles are focused.
2. The salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization, Buddhist, Hindu and Indo-Sarsanic Architecture are introduced.
3. Architectural design concepts, principles of planning and composition are imparted.
4. To enable the student to understand town planning from ancient times to modern times.
5. To impart the concepts of town planning standards, land scaping and expansion of towns.

**Course Outcomes**:

Upon the successful completion of this course:

a. The student should be able to distinguish architectural styles of eastern and western world.
b. The student should understand the importance of Orders of architecture.
c. Should be able to compose spaces of buildings using design concepts, planning principles.
d. Should understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.

**SYLLABUS:**

**UNIT – I**

**History of Architecture:** Western Architecture:Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole,

Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

**UNIT – II**

**Architectural Design**: Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

**UNIT - III**

**Principles of Planning:** Principles of planninga residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

**Post-classic Architecture:** Introduction of post-classic architecture-contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping.

**UNIT – IV**

**Histroical Back Ground of Town Planning:** Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

**UNIT – V**

**Modern Town Planning:** Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning-Neighborhood Planning.

**Standards of Town planning:** Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

**UNIT – VI**

**Land Scaping and Expansion of Towns:** Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns-floating towns- sky scrapers-pyramidal cities.

**TEXTBOOKS:**

1. ‘The great ages of World Architecture’ by G.K. Hiraskar.
2. ‘Planning and Design of Buildings by Section of Architecture’ by Y. S. Sane.

3. ‘Professional Practice’ by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, New Delhi.
4. ‘Indian Architecture – Vol. I & II’ by Percy Brown, Taraporevala Publications, Bombay.
5. ‘Fundamentals of Town Planning’by G.K. Haraskar.

**REFERENCES:**

1. ‘Drafting and Design for Architecture’ by Hepler, Cengage Learning
2. ‘Architect’s Portable Handbook’ by John Patten Guthrie – Mc Graw Hill International Publications.
3. ‘Mordern Ideal Homes for India’ by R. S. Deshpande.
4. ‘Town and County Planning’by A.J.Brown and H.M.Sherrard.
5. ‘Town Design’by Federik Glbbard, Architectural press, London.

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## CE606 ( e ) - FINITE ELEMENT METHOD

**(Open Elective)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Equip the students with the fundamentals of Finite Element Analysis
2. Enable the students to formulate the design problems into FEA.
3. Enable the students to solve Boundary value problems using FEM.

**Course Outcomes**:

Upon completion of the course, the student will be able to

a. Solve simple boundary value problems using Numerical technique of Finite element method.
b. Develop finite element formulation of one and two dimensional problems and solve them.
c. Assemble Stiffness matrices, Apply boundary conditions and solve for the displacements.
d. Compute Stresses and Strains and interpret the result.

**SYLLABUS:**

**UNIT-I**

**Introduction:** Review of stiffness method- Principle of Stationary potential energy-Potential energy of an elastic body- Rayleigh-Ritz method of functional approximation.

**UNIT-II**

Principles of Elasticity- Equilibrium Equations- Strain Displacement relationships- Constitutive relationship for plane stress, plane stain and axi symmetric bodies of revolution with axi symmetric loading.

**UNIT-III**

**Finite Element formulation of truss element:** Stiffness matrix- properties of stiffness matrix –Selection of approximate displacement functions- solution of a plane truss- transformation matrix- Galerkin's method for 1-D truss – Computation of stress in a truss element.

**UNIT-IV**

**Finite element formulation of Beam elements:** Beam stiffness- assemblage of beam stiffness matrix- Examples on Analysis of beams Subjected to Concentrated and Distributed loading.

**UNIT-V**

Finite element formulation for plane stress and plane strain problems- Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces

**UNIT-VI**

**Iso-parametric Formulation:** An isoparametric bar element- plane bilinear isoparametric element – quadratic plane element - shape functions, evaluation of stiffness matrix, consistent nodal load vector - Gauss quadrature for performing numerical integrations.

**TEXT BOOKS**

1. ‘A first course in the Finite Element Method’by Daryl L. Logan, Thomson Publications.
2. ‘Introduction to Finite Elements in Engineering’ by Tirupati R. Chandrupatla, Ashok D. Belgundu, PHI publications.
3. ‘Introduction to Finite Element Method’ by Desai & Abel CBS Publications.

**REFERENCES**:

1. ‘Concepts and applications of Finite Element Analysis’by Robert D. Cook, Michael E Plesha, John Wiley & sons Publications.
2. ‘Text book of Finite Element Analysis’by P. Seshu, Prentice Hall of India.

## CE606 ( f ) - GREEN TECHNOLOGIES

**(Open Elective)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To present different concepts of green technologies.
2. To acquire principles of Energy efficient technologies.
3. To impart knowledge on the methods of reducing $CO_2$ levels in atmosphere.
4. To gain knowledge of the importance of life cycle assessment
5. To learn the importance of green fuels and its impact on environment.

**Course Learning Outcomes**

Upon successful completion of this course, the students will be able to:

a. Enlist different concepts of green technologies in a project
b. Understand the principles of Energy efficient technologies
c. Estimate the carbon credits of various activities
d. Identify the importance of life cycle assessment
e. Recognize the benefits of green fuels with respect to sustainable development.

**SYLLABUS:**

**UNIT- I**

Introduction : Green Technology – definition- Importance – Historical evolution – advantages and disadvantages of green technologies-factors affecting green technologies- Role of Industry, Government and Institutions – Industrial Ecology – role of industrial ecology in green technology.

**UNIT- II**

Cleaner Production (CP): Definition – Importance – Historical evolution - Principles of Cleaner Production–Benefits–Promotion – Barriers – Role of Industry, Government and Institutions – clean development mechanism, reuse, recovery, recycle, raw material substitution-Wealth from waste, case studies.

**UNIT- III**

Cleaner Production Project Development and Implementation: Overview of CP Assessment Steps and Skills, Process Flow Diagram, Material Balance,

CP Option Generation – Technical and Environmental Feasibility analysis – Economic valuation of alternatives - Total Cost Analysis – CP Financing – Preparing a Program Plan – Measuring Progress- ISO 14000.

**UNIT- IV**

Pollution Prevention and Cleaner Production Awareness Plan – Waste audit – Environmental Statement, carbon credit, carbon sequestration, carbon trading, Life Cycle Assessment - Elements of LCA – Life Cycle Costing – Eco Labelling.

**UNIT -V**

Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Non-conventional energy sources: Solar Energy-solar energy conversion technologies and devices, their principles, working and application.

**UNIT- VI**

Green Fuels – Definition-benefits and challenges – comparison of green fuels with conventional fossil fuels with reference to environmental, economical and social impacts- public policies and market-driven initiatives.
Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in Indian context; tidal and geothermal energy.

**TEXT BOOKS:**

**REFERENCES:**

1. ‘Pollution Prevention: Fundamentals and Practice’ by Paul L Bishop (2000), McGraw Hill International.
2. ‘Pollution Prevention and Abatement Handbook – Towards Cleaner Production’ by World Bank Group (1998), World Bank and UNEP, Washington D.C.
3. ‘Cleaner Production Audit’ by Prasad Modak, C.Visvanathan and Mandar Parasnis (1995), Environmental System Reviews, No.38, Asian Institute of Technology, Bangkok
4. ‘Handbook of Organic Waste Conversion’ by Bewik M.W.M.
5. ‘Energy, The Solar Hydrogen Alternative’ by Bokris J.O.
6. ‘Non-conventional Energy Sources’ by Rai G.D.
7. ‘Solar Energy’ by Sukhatme S.P.
8. ‘Waste Energy Utilization Technology’ by Kiang Y. H.

**III Year – II SEMESTER**

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## CE607-COMPUTER AIDED ENGINEERING DRAWING

| | | | |
|---|---|---|---|
| Lecture : | -- | Internal Assessment : | Marks |
| Tutorial : | -- | Semester End Examination : | Marks |
| Practical : | 3 hrs/Week | Credits : | 2 |

**Course Objectives:**
The objective of this course is:

- To enhance the students knowledge and skills in engineering drawing
- To introduce computer aided drafting packages and commands for modeling and sketching.
- To learn surface modeling techniques required designing and machining
- To draw the geometric entities and create 2D and 3D wire frame models.
- To learn various modelling techniques such as edit, zoom, cross hatching, pattern filling,rotation, etc.

**Course outcomes:**
Up on completion of the course, the student shall be able to :

1) Understand the paper –space environment thoroughly
2) Develop the components using 2D and 3D wire frame models through various editing commands.
3) Generate assembly of various components of compound solids.

**UNIT-I**

**Objective:** The knowledge of projections of solids is essential in 3D modelling and animation. The student will be able to draw projections of solids. The objective is to enhance the skills they already acquired in their earlier course in drawing of projection and sections of solids.

**Projections Of Planes & Solids** : Projections of Regular Solids inclined to both planes – Auxiliary Views. Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**UNIT-II**

**Objective:** The knowledge of development of surfaces of solids is required in designing and manufacturing of the objects. Whenever two or more solids combine, a definite curve is seen at their intersection. The intersection of

solids also plays an important role in designing and manufacturing. The objective is to impart this knowledge through this topic.

**Development And Interpenetration Of Solids**: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts.
Interpenetration of Right Regular Solids – Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

**UNIT-III**

**Objective:** Isometric projections provide a pictorial view with a real appearance. Perspective views provides a realistic 3D View of an object. The objective is to make the students learn the methods of Iso and Perspective views.

**Isometric Projections :** Principles of Isometric Projection – Isometric Scale – Isometric Views
– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – IsometricProjection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

**Transformation of Projections:** Conversion of Isometric Views to Orthographic Views – Conventions.

**Perspective Projections:** Perspective View: Points, Lines, Plane Figures and Simple Solids,Vanishing Point Methods(General Method only).

## PART- B COMPUTER AIDED DRAFTING

**UNIT- IV**

**Introduction To Computer Aided Drafting:** Generation of points, lines, curves, polygons, dimensioning. Types of modelling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modelling, 3D wire frame modelling.

**UNIT -V**

**Objective:** By going through this topic the student will be able to understand the paper-space environment thoroughly.

**View Points And View Ports:** view point coordinates and view(s) displayed, examples to exercise different options like save, restore, delete, joint, single option.

**UNIT -VI**

**Computer Aided Solid Modelling:** Isometric projections, orthographic projections of isometric projections, Modelling of simple solids, Modelling of Machines & Machine Parts.

**TEXT BOOKS :**

1.Engineering Graphics, K.C. john, PHI Publications.

2.Engineering drawing by N.D Bhatt, Charotar publications.

**REFERENCES:**


1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex.
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad–T Jeyapoovan, vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age.
5. Engineering Drawing – RK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah, Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
9. Engineering Graphics – PI Varghese, Mc Graw Hill
10. Text book of Engineering Drawing with auto-CAD, K.Venkata Reddy/B.S . Publications.


**Internal Evaluation**: Max. Marks: 30

The total internal evaluation marks are distributed in following two components:

1. Day-to-day work : 20 marks
2. Internal test : 10 marks

I Mid (Internal Test 1) Examination Part A - Conventional drawing Exam II Mid (Internal Test 2) Examination Part B - In Computer Lab

(Note: The duration of the internal test is 2 hours and it must be conducted as per the schedules notified. The internal test may be conducted for 40 marks and it may be reduced to 10 marks).

**End Semester Examination** (Total Duration: 4 Hours, Max. Marks: 70)

PART A – Conventional drawing pattern (Duration: 2 Hours, Marks: 35)

PART B – Computer lab pattern using any drafting packages (Duration: 2 Hours, Marks: 35)

(Note: both PART A and PART B are compulsory and are to be conducted in separate sessions)

Since the pattern of the internal and external examination is not specified in the R13 academic regulation, it is requested that the above pattern may be approved.

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**III Year – II SEMESTER**

| T | P | C |
|---|---|---|
| 0 | 3 | 2 |

## CE608-TRANSPORTATION ENGINEERING LAB

| | | | |
|---|---|---|---|
| Lecture : | -- | Internal Assessment : | 25 Marks |
| Tutorial : | -- | Semester End Examination : | 50 Marks |
| Practical : | 3 hrs/week | Credits : | 2 |

**Course Learning Objectives:**

The objective of this course is:

1. To test crushing value, impact resistance, specific gravity and water absorption, percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.
2. To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
3. To test the stability for the given bitumen mix.
4. To carry out surveys for traffic volume, speed and parking.

**Course outcomes:**

a. Ability to test aggregates and judge the suitability of materials for the road construction
b. Ability to test the given bitumen samples and judge their suitability for the road construction
c. Ability to obtain the optimum bitumen content for the mix design
d. Ability to determine the traffic volume, speed and parking characteristics.

**SYLLABUS:**

**I. ROAD AGGREGATES:**

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

**II. BITUMINOUS MATERIALS:**

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

**III. BITUMINOUS MIX:**

1. Marshall Stability test.

**IV. TRAFFIC SURVEYS:**

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

**V. DESIGN & DRAWING:**

1. Earthwork calculations for road works.
2. Drawing of road cross sections.
3. Rotors intersection design.

**LIST OF EQUIPMENT:**

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers.
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Length and elongation gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Viscometer.
11. Marshal Mix design apparatus.
12. Enoscope for spot speed measurement.
13. Stop Watches

**TEXT BOOKS:**

1. 'Highway Material Testing Manual' by S.K. Khanna, C.E.G Justo and A.Veeraraghavan, Neam Chan Brothers New Chand Publications, New Delhi.

**REFERENCE BOOKS:**

1. IRC Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.

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**IV Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

**CE701-ENVIRONMENTAL ENGINEERING – II**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city.
2. Provide knowledge of characterisation of wastewater generated in a community.
3. Impart understanding of treatment of sewage and the need for its treatment.
4. Summarize the appurtenance in sewerage systems and their necessity.
5. Teach planning, and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems.
6. Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers.

**Course Outcomes**:

By the end of successful completion of this course, the students will be able to:

a. Plan and design the sewerage systems
b. Characterisation of Sewage
c. Select the appropriate appurtenances in the sewerage systems
d. Selection of suitable treatment flow for sewage treatment
e. Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river

**SYLLABUS:**

**UNIT – I**:

**Introduction to sanitation** – systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage –

classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers.

**UNIT – II**:

**Pumping of wastewater**: Pumping stations – location – components– types of pumps and their suitability with regard to wastewaters.

**House Plumbing**: systems of plumbing-sanitary fittings and other accessories–one pipe and two pipe systems – Design of building drainage.

**UNIT – III**:

**Sewage characteristics** – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations.

Treatment of sewage : Primary treatment-Screens-grit chambers-grease traps–floatation– sedimentation – design of preliminary and primary treatment units.

**UNIT – IV:**

**Secondary treatment**: Aerobic and anaerobic treatment process-comparison.

**Suspended growth process**: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, Oxidation ponds, Aerated Lagoons.

**Attached Growth Process:** Trickling Filters–mechanism of impurities removal- classification–design-operation and maintenance problems. RBCs, Fluidized bed reactors.

**UNIT V:**

**Miscellaneous Treatment Methods**: Nitrification and Denitrification – Removal of Phosphates –UASB–Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design–disposal of septic tank effluent.

**UNIT – VI**:

**Bio-solids (Sludge) management**: Characteristics- handling and treatment of sludge-thickening – anaerobic digestion of sludge.

**Disposal of sewage**: methods of disposal – disposal into water bodies-Oxygen Sag Curve-disposal on land- sewage sickness.

**Text Books**

1. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Elements of Environmental Engineering by K.N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.
3. Environmental Engineering by Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3rd Edition.

**References**

1. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, by Garg, S.K.; Khanna Publishers.
2. Sewage treatment and disposal by Dr. P.N. Modi& Sethi.
3. Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
4. Environmental Engineering by D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

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**IV Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

## CE704-WATER RESOURCES ENGINEERING–II

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course is designed to

1. introduce the types of irrigation systems
2. introduce the concepts of planning and design of irrigation systems
3. discuss the relationships between soil, water and plant and their significance in planning an irrigation system.
4. understand design methods of erodible and non-erodible canals
5. know the principles of design of hydraulic structures on permeable foundations.
6. know the concepts for analysis and design principles of storage and diversion head works.
7. learn design principles of canal structures

**Course Outcomes**

At the end of the course the student will be able to

a. estimate irrigation water requirements
b. design irrigation canals and canal network
c. plan an irrigation system
d. design irrigation canal structures
e. plan and design diversion head works
f. analyse stability of gravity and earth dams
g. design ogee spillways and energy dissipation works

**SYLLABUS:**

**UNIT-I**

**Irrigation:** Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of

irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

**UNIT-II**

**Canals:** Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

**UNIT III**

**Canal Structures:**

**Falls:** Types and location, design principles of Sarda type fall and straight glacis fall.

**Regulators:** Head and cross regulators, design principles

**Cross Drainage Works:** Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

**Outlets**: types, proportionality, sensitivity and flexibility

**River Training:** Objectives and approaches

**UNIT-IV**

**Diversion Head Works:** Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

**UNIT-V**

**Reservoir Planning:** Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

**Dams:** Types of dams, selection of type of dam, selection of site for a dam.

**Gravity dams:** Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries, grouting.

**UNIT-VI**

**Earth Dams:** Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters, stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions.

**Spillways**: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

**TEXT BOOKS:**

1. ‘Irrigation and Water Power Engineering’by Punmia B C,P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi.
2. ‘Irrigation and Water Resources Engineering’by Asawa G L (2013), New Age International Publishers.
3. ‘Irrigation Engineering’by Raghunath H.M (2012), Wiley India.
4. ‘Irrigation Water Resources and Water Power Engineering’by Modi P N (2011), Standard Book House, New Delhi.

**REFERENCES:**

1. ‘Water Resources Engineering’ by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi.
2. ‘Irrigation Engineering’ by Sharma R.K. and Sharma, T.K (2012), S.Chand & Co Publishers.
3. ‘Water Resources Engineering’by Satyanarayana Murthy Challa (2008), New Age International Publishers.

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**IV Year – I SEMESTER**

| T | P | C |
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| 3+1* | 0 | 3 |

## CE703-CONSTRUCTION TECHNOLOGY AND MANAGEMENT

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To introduce to the student the concept of project management including network drawing and monitoring.
2. Tto introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery.
3. To introduce the importance of safety in construction projects.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

1. Appreciate the importance of construction planning.
2. Understand the functioning of various earth moving equipment.
3. Know the methods of production of aggregate products and concreting.
4. Apply the gained knowledge to project management and construction techniques.

**SYLLABUS:**

**UNIT- I**

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method.

**UNIT -II**

Project evaluation and review technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources.

**UNIT- III**

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks.

and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers.

**UNIT -IV**

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets.

**UNIT -V**

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing.

**UNIT -VI**

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering.

**TEXT BOOKS:**

1. ‘Construction Planning , Equipment and Methods’ by Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill.
2. ‘Construction Project Management Theory and Practice’by Kumar Neeraj Jha (2011), Pearson.
3. ‘Construction Technology’ by Subir K. Sarkar and Subhajit Saraswati, Oxford University press.

**REFERENCES:**

1. ‘Construction Project Management - An Integrated Approach’ by Peter Fewings , Taylor and Francis
2. ‘Construciton Management Emerging Trends and Technologies’ by Trefor Williams , Cengage learning .

**IV Year – I SEMESTER**

| T | P | C |
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| 3+1* | 0 | 3 |

## CE702-PRESTRESSED CONCRETE

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with concepts of prestressing.
2. Equip student with different systems and devices used in prestressing.
3. Understand the different losses of prestress including short and long term losses.
4. Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion.

**Course Outcomes**:

At the end of this course the student will be able to

a. Understand the different methods of prestressing.
b. Estimate the effective prestress including the short and long term losses.
c. Analyze and design prestressed concrete beams under flexure and shear.
d. Understand the relevant IS Codal provisions for prestressed concrete

**SYLLABUS:**

**UNIT-I**

Basic concepts of Prestressing- Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Stress Corrosion- Durability, Fire Resistance, Cover Requirements.

**UNIT-II**

Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems, Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section-

pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

**UNIT-III**

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design.

**UNIT-IV**

Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure- Control of deflections- Factors influencing- Prediction of short term and long term deflections.

**UNIT-V**

Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

**UNIT-IV**

Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

**TEXT BOOKS**

1. ‘Prestressed Concrete’ by N. Krishna Raju, Tata McGraw hill
2. ‘Prestressed Concrete’ by S. Ramamrutham

**REFERENCES:**

1. ‘Prestressed Concrete’ by P. Dayaratnam
2. ‘Prestressed Concrete’ by T. Y. Lin & Burns, Wiley Publications

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**IV Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

## CE802-REMOTE SENSING AND GIS APPLICATIONS

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course is designed to

1. Introduce the basic principles of Remote Sensing and GIS techniques.
2. Learn various types of sensors and platforms
3. learn concepts of visual and digital image analyses
4. Understand the principles of spatial analysis
5. Appreciate application of RS and GIS to Civil engineering

**Course outcomes**

At the end of the course the student will be able to

a. Be familiar with ground, air and satellite based sensor platforms.
b. Interpret the aerial photographs and satellite imageries
c. Create and input spatial data for GIS application
d. Apply RS and GIS concepts in water resources engineering

**SYLLABUS:**

**UNIT – I**

**Introduction to remote sensing:** Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems.

**Sensors and platforms:** Introduction, types of sensors, airborne remote sensing, spaceborne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT.

**UNIT – II**

**Image analysis: I**ntroduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification.

**UNIT – III**

**Geographic Information System:** Introduction, key components, application areas of GIS, map projections.

**Data entry and preparation**: spatial data input, raster data models, vector data models.

**UNIT – IV**

**Spatial data analysis**: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing.

**UNIT – V**

**RS and GIS applications General**: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications.

**UNIT - VI**

**Application to Hydrology and Water Resources: F**lood zoning and mapping, groundwater prospects and potential recharge zones, watershed management.

**TEXT BOOKS:**

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

**REFERENCES:**

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006
3. 'Introduction to Geographic Information Systems' by Kand Tsung Chang, McGraw Hill Higher Education, 2009.
4. 'Basics of Remote sensing & GIS' by Kumar S, Laxmi Publications, New Delhi, 2005.
5. 'Principals of Geographical Information Systems' by Burrough P A and R.A. McDonnell, Oxford University Press, 1998.

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**IV Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

**Elective-I**

## CE705 ( a ) - GROUND IMPROVEMENT TECHNIQUES

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.
4. To make the student learn the concepts, purpose and effects of grouting.

**Course Outcomes**:

a. By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
b. The student should be in a position to design a reinforced earth embankment and check its stability.
c. The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.
d. The student should be able to understand the concepts and applications of grouting.

**SYLLABUS:**

**UNIT- I**

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

**UNIT -II**

Dewatering – sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis

**UNIT- III**

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

**UNIT- IV**

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

**UNIT- V**

Geosynthetics – geotextiles – types – functions , properties and applications – geogrids , geomembranes and gabions - properties and applications.

**UNIT-VI**

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests

**TEXT BOOKS:**

1. ‘Ground Improvement Techniques’by Purushotham Raj, Laxmi Publications, New Delhi.
2. ‘Ground Improvement Techniques’ by Nihar Ranjan Patro, Vikas Publishing House (P) Limited, New Delhi.
3. ‘An introduction to Soil Reinforcement and Geosynthetics’ by G.L.Siva Kumar Babu, Universities Press.

**REFERENCE BOOKS:**

1. ‘Ground Improvement’ by MP Moseley, Blackie Academic and Professional, USA.
2. ‘Designing with Geosynethetics’ by RM Koerner, Prentice Hall.

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## CE705 ( b ) - AIR POLLUTION AND CONTROL

**(Elective-I)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course will address the following:

1. To know the analysis of air pollutants
2. To know the Threshold Limit Values (TLV) of various air pollutants
3. To acquire the design principles of particulate and gaseous control
4. To learn plume behaviour in different environmental conditions
5. To learn carbon credits for various day to day activities

**Course Learning Outcomes**:

Upon successful completion of this course, the students will be able to:

a. Decide the ambient air quality based the analysis of air pollutants.
b. The design principles of particulate and gaseous control measures for an industry.
c. Judge the plume behaviour in a prevailing environmental condition
d. Estimate carbon credits for various day to day activities.

**SYLLABUS:**

**UNIT – I**

**Air Pollution**: Sampling and analysis of air pollutants, conversion of ppm into $\mu g/m^3$. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution - Climate Change and its impact - Carbon Trade.

**UNIT-II**

**Thermodynamics and Kinetics of Air-pollution:** Applications in the removal of gases like SOx, NOx, CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

**UNIT – III**

**Meteorology and Air Pollution:** Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of

Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams, Plume Rise Models.

**UNIT-IV**

**Ambient Air Quality Management**: Monitoring of SPM, SO2; NOx and CO - Stack Monitoring for flue gases - Micro-meteorological monitoring - Weather Station. Emission Standards- Gaussian Model for Plume Dispersion.

**UNIT-V**

**Air Pollution Control**: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipments – Settling Chambers, Cyclone separators –Fabric filters– scrubbers, Electrostatic precipitators.

**UNIT – VI**

**Air Pollution Control Methods**: Control of NOx and SOx emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

**TEXT BOOKS:**

1. Air Pollution by M.N. Rao and H.V.N. Rao – Tata McGraw Hill Company.
2. Air Pollution and Control by KVSG Murali Krishna, Laxmi Publications, New Delhi.

**REFERENCE:**

1. An Introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air pollution by Wark and Warner - Harper & Row, New York.

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## CE705 ( c ) - MATRIX METHODS OF STRUCTURAL ANALYSIS

**(Elective-I)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Learn the fundamental concepts of matrix structural mechanics, such as the stiffness method.
2. The concepts of structural analysis learnt in mechanics of solids and structures course.
3. Understanding the analysis of statically determinate and indeterminate structures such as trusses, beams, frames and plane stress problems.
4. Learn the concepts of the stiffness method and apply it to a variety of structural problems involving trusses, beams, frames, and plane stress.

**Course Outcomes**:

Upon completion of the course, the student will be able to

a. Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent deformations, force and equilibrium methods.
b. Perform structural analysis using the stiffness method.
c. Solve multiple degree of freedom two dimensional problems involving trusses, beams, frames and plane stress.

**SYLLABUS:**

**UNIT-I**

Introduction of Matrix methods of analysis – Properties of Matrices, singular matrix, Rank of a Matrix and Rank deficiency- Static indeterminacy and Kinematic indeterminacy – Degree of freedom – Structure idealization- stiffness and flexibility methods – Suitability.

**UNIT-II**

Generation Element stiffness matrix for truss element, beam element and torsional element- Element force - displacement equations.

**UNIT-III**

Stiffness method for beam Elements – Element and global stiffness equation – coordinate transformation and global assembly – structure stiffness matrix equation – analysis of continuous beams.

**UNIT-IV**

Stiffness method for plane trusses and Grid elements – development of stiffness matrix – coordinate transformation. Examples of pin jointed trusses and simple grid problems.

**UNIT-V**

Additional topics in stiffness methods – Discussion of band width – semi band width – static condensation – sub structuring –Loads between joints-Support displacements.

**UNIT-VI**

Space trusses and frames - Member stiffness for space truss and space frame–Transformation matrix from Local to Global – Analysis of simple trusses, beams and frames.

**TEXT BOOK :**

1. ‘Matrix Methods of Structural Analysis’ by Pundit and Gupta
2. ‘Matrix Methods of Structural Analysis’by Weaver and Gere, CBS Publishers.

**REFERENCES:**

1. ‘Matrix analysis of structures’ by Robert E Sennet- Prentice Hall-Englewood cliffs-New Jercy.
2. ‘Advanced structural analysis’ by Dr. P. Dayaratnam- Tata Mc Graw hill publishing company limited.

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## CE705 ( d ) - URBAN HYDROLOGY

**(Elective-I)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course is designed to:

1. appreciate the impact of urbanization on catchment hydrology
2. understand the importance of short duration rainfall runoff data for urban hydrology studies.
3. learn the techniques for peak flow estimation for storm water drainage system design.
4. understand the concepts in design of various components of urban drainage systems.
5. learn some of the best management practices in urban drainage.
6. understand the concepts of preparation master urban drainage system.

**Course Outcomes**

At the end of the course the student will be able to

a. develop intensity duration frequency curves for urban drainage systems.
b. develop design storms to size the various components of drainage systems.
c. apply best management practices to manage urban flooding.
d. prepare master drainage plan for an urbanized area.

**SYLLABUS:**

**UNIT I**

**Introduction:** Urbanisation and its effect on water cycle – urban hydrologic cycle – trends in urbanisation – Effect of urbanisation on hydrology.

**UNIT II**

**Precipitation Analysis:** Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration -Frequency (IDF)curves, design storms for urban drainage systems.

**UNIT III**

**Approaches to urban drainage**: Time of concentration, peak flow estimation approaches , rational method, NRCS curve number approach, runoff quantity and quality, wastewater and stormwater reuse , major and minor systems.

**UNIT IV**

**Elements of drainage systems**: Open channel, underground drains, appurtenances, pumping, source control.

**UNIT V**

**Analysis and Management:** Stormwater drainage structures, design of stormwater network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for stormwater management.

**UNIT IV**

**Master drainage plans**: Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes , planning objectives, comprehensive planning , use of models in planning.

**TEXT BOOKS:**

1. ‘Manual on Drainage in Urbanised area’by Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, (1987 - 2 volumes), UNESCO,
2. ‘Urban Hydrology’ by Hall M J (1984), Elsevier Applied Science Publisher.
3. ‘Hydrology – Quantity and Quality Analysis’ by Wanielista M P and Eaglin (1997), Wiley and Sons.
4. ‘Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling’ by Akan A.O and R.L. Houghtalen (2006), Wiley International.

**REFERENCES**

1. ‘Stormwater Detention for Drainage’ by Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. ‘Urban water cycle processes and interactions’ by Marsalek et al (2006), Publication No. 78, UNESCO, Paris (http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf)
3. ‘Frontiers in Urban Water Management – Deadlock or Hope’ by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing.

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## CE705 ( e ) - ADVANCED SURVEYING

**(Elective-I)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is to enable the students to,

1. Understand the basics of Geodetic Surveying and triangulation systems.
2. Understand the hygrographic surveying and prediction of tides.
3. Understand the Photogrammetric Surveying and Astronomical Surveying.
4. Understand the importance and applications of total stations and GPS.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. The student should be able to conduct different types of surveys for obtaining better results.
b. The student should be able to utilize the total stations for getting the required information.
c. The student should be capable of using the GPS instrument to obtain appropriate information of the objectsand their positions.

**SYLLABUS:**

**UNIT – I**

**Geodetic Surveying:** Definition, importance, triangulation system, order of triangulation, size and shape of triangulation, strength of figure criterion, triangulation fieldwork, base line measurement- tape corrections, problems in baseline measurement, measurement of angles.

**UNIT –I I**

**Hydrographic Surveying:** Tides-lunar tides, solar tides, spring and neap tides, measurement of tides- shore lines, soundings, sounding equipments, locating soundings by cross rope method and range and time intervals-mean sea level-prediction of tides**.**

**UNIT – III**

**Photogrammetric Surveying:** Basic principles,-photo theodolite, horizontal and vertical angles from terrestrial photographs, elevation of a point by

photographic measurement, determination of focal length of the lens, Aerial camera- scale of vertical photograph, scale of tilted photograph, combined effects of tilt and relief, stereoscopic vision, mosaics.

**UNIT – IV**

**Astronomical Surveying:** Spherical Trigonometry, latitude and longitude, solar system, astronomical teams, coordinate systems-altitude, azimuth system, declination, hour angle system, time and astronomical work-sidereal time, apparent solar time, mean solar time, standard time, standard time, application of astronomy in surveying, corrections to astronomical observations.

**UNIT – V**

**Total stations:** Importance, measurement of horizontal angles, vertical angles, horizontal distance, slope distance, height of object-remote elevation measurement (REM), remote distance measurement (RDM)-radial and continuous distances for measuring the lengths and sides of the closed circuits, areas and perimeters calculations.

**UNIT – VI**

**Global Positioning System:** Principles of GPS, components of GPS, types of GPS and accuracy, applications of GPS, sources of error GPS and limitations.

**TEXT 'BOOKS:**

1. ‘Surveying and Levelling’ by R. Subramanian, Oxford University Press, New Delhi.
2. A text book of Surveying’ by C. Venkatramaiah, University Press, New Delhi.
3. ‘Surveying Vol. II and Vol. III (Higher Surveying)’ by Dr. B. C. Punmia, Ashok K. Jain and Arun K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.
4. ‘Advanced Surveying’ by Satheesh Gopi, R. Sathikumar and N. Madhu, Pearson, New Delhi.

**REFERENCES:**

1. ‘Remote Sensing and its Applications’ by L A R Narayan, Universities Press, New Delhi.
2. ‘Geographical Information Science’ by Narayan Panigrahi, Universities Press, New Delhi.
3. ‘Basics of Remote Sensing and GIS’ by Dr. S. Kumar, University Science Press, New Delhi.

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## CE705 ( f ) - INTERIOR DESIGNS AND DECORATIONS

**(Elective-I)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is to enable the students to

1. Understand the elements and principles of interior designs and decorations.
2. Learn the importance of art elements in the composition of building spaces.
3. Learn the new design concepts for developing interiors of buildings.
4. Learn the application of colors, lightings, furniture in creating beautiful interiors.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. understand the importance of interior designs and decorations.
b. Should realize the use of art elements in the composition of building spaces.
c. Should learn the new design concepts for developing interiors of buildings.
d. Learn be able to apply colors, lightings, furniture in creating beautiful interiors.

**SYLLABUS:**

**UNIT-I**

Development of interior design concepts- importance for interiors in modern buildings, changing trends and salient features, objectives of aesthetic planning - beauty, expressiveness, functionalism, economy- good taste - meaning and importance- developing skill in aesthetics.

**UNIT-II**

Designs- concepts, meaning, purpose, types - structural and decorative characteristics, forms to function relationship, **e**lements of designs - line and direction, form and shape, size, colour, light, pattern, texture and space - application of elements to form designs.

**UNIT-III**

Application of colour harmonies in the interiors and exteriors –effects of light on colour, Illusion of colour, psychology of colour, effect of colour on each other-uses and application of colours- walls, wall finishes, ceilings, roofs, decorative exteriors.

**UNIT-IV**

Importance of lighting – artificial lighting - light sources, types and uses of light, specific factors in lighting- measurements of lighting, psychological aspects of light, glare, types of glare and prevention– selection of lamps, lighting fixtures, lighting for various areas and activities.

**UNIT-V**

Principles of design – balance, rhythm, emphasis, harmony, proportion - meaning and application of design concepts in the interior and exterior houses and other commercial buildings- development of design from motifs, elements of art-selection of different art forms, display of art pieces.

**UNIT –VI**

Interior furnishings- floors, floor coverings, soft furnishings, furniture-selection and arrangement, placement of accessories, home accessories-interior decorations- flower arrangement, floor decorations, interior decoration trends in India.

**TEXT BOOKS:**

1. ‘Interior Design and Decoration’ by Premavathy Seetharaman and Praveen Pannu, CBS Publishers and distributors, New Delhi, 2005.
2. ‘Building Construction’ by Rangawala, S.C, Charter publishing house, Anand, 1963.
3. ‘Interior Design Principles and practice’ by Pratap R.M., Standard publishers distribution, Delhi, 1988.

**REFERENCES:**

1. ‘How to see, how to paint it’ by Judy M., Harpen Colling publishers,London, 1994.
2. ‘Lighting for a beautiful Home’ by Jan Orcharchd, Dunestyle publishing Ltd., U.S.A., 1993.
3. ‘The Complete Home Decorator’ by Stewart and Sally .W., Annes publishers Ltd., New York, 1997.

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**IV Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 0 | 3 | 2 |

## CE707-ENVIRONMENTAL ENGINEERING LAB

| | | | |
|---|---|---|---|
| Lecture : | -- | Internal Assessment : | Marks |
| Tutorial : | -- | Semester End Examination : | Marks |
| Practical : | 3 hrs/week | Credits : | 2 |

**Course Learning Objectives:**

The course will address the following:

1. Estimation some important characteristics of water and wastewater in the laboratory.
2. It also gives the significance of the characteristics of the water and wastewater.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

a. Estimation some important characteristics of water and wastewater in the laboratory.
b. Draw some conclusion and decide whether the water is potable or not.
c. Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments.
d. Estimation of the strength of the sewage in terms of BOD and COD.

**SYLLABUS:**

**List of Experiments**

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil.
5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.

8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.

**NOTE:** At least 10 of the above experiments are to be conducted.

**List of Equipments**

1) pH meter
2) Turbidity meter
3) Conductivity meter
4) Hot air oven
5) Muffle furnace
6) Dissolved Oxygen meter
7) U–V visible spectrophotometer
8) COD Reflux Apparatus
9) Jar Test Apparatus
10) BOD incubator
11) Autoclave
12) Laminar flow chamber
13) Hazen's Apparatus

**Text Books**

1. Standard Methods for Analysis of Water and Waste Water – APHA.
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi.

**Reference**

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

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**IV Year – I SEMESTER**

| T | P | C |
|---|---|---|
| 0 | 3 | 2 |

## CE806-GIS & CAD LAB

| | | | |
|---|---|---|---|
| Lecture : | -- | Internal Assessment : | 30 Marks |
| Tutorial : | -- | Semester End Examination : | 70 Marks |
| Practical : | 3 hrs/Week | Credits : | 2 |

**Course Learning Objectives:**

The course is designed to

1. introduce image processing and GIS software
2. familiarize structural analysis software
3. understand the process of digitization, creation of thematic map from toposheets and maps.
4. learn to apply GIS software to simple problems in water resources and transportation engineering.
5. learn to analyse 2 D and 3D frame steel tubular truss using structural analysis software.
6. learn to analyse and design retaining wall and simple towers.

**Course outcomes**

At the end of the course the student will be able to

a. work comfortably on GIS software
b. digitize and create thematic map and extract important features
c. develop digital elevation model
d. use structural analysis software to analyse and design 2D and 3D frames.
e. design and analyse retaining wall and simple towers using CADD software.

**GIS:**

**SOFTWARES:**

1. Arc GIS 9.0
2. ERDAS 8.7
3. Mapinfo 6.5

Any one or Equivalent.

**EXCERCISES IN GIS:**

1. Digitization of Map/Toposheet
2. Creation of thematic maps.
3. Estimation of features and interpretation
4. Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering & Transportation Engineering.

**COMPUTER AIDED DESIGN AND DRAWING:**

**SOFTWARE:**

1. STAAD PRO / Equivalent/
2. STRAAP
3. STUDDS

**EXCERCISIES:**

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple Tower Analysis and Design

**TEXT BOOK:**

1. 'Concept and Techniques of GIS' by C.P.L.O. Albert, K.W. Yong, Printice Hall Publishers.

**IV Year – II SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

## CE801-ESTIMATING, SPECIFICATIONS & CONTRACTS

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is to enable the students to:

1. Understand the quantity calculations of different components of the buildings.
2. Understand the rate analysis of different quantities of the buildings components.
3. Learn various specifications and components of the buildings.

**Course Outcomes**:

Upon the successful completion of this course:

a. The student should be able to determine the quantities of different components of buildings.
b. The student should be in a position to find the cost of various building components.
c. The student should be capable of finalizing the value of structures.

**SYLLABUS:**

**UNIT – I**

General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

**UNIT – II**

Rate Analysis – Working out data for various items of work over head and contigent charges.

**UNIT-III**

Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

**UNIT – IV**

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings-
Standard specifications for different items of building construction.

**UNIT-V**

Detailed Estimation of Buildings using individual wall method.

**UNIT -VI**

Detailed Estimation of Buildings using centre line method.

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of SIX questions from Unit 1 to Unit 4, out of which THREE are to be answered (60% weight-age) & ONE mandatory question (40% weight-age) from Units 5 & 6 is to be answered.

**TEXT BOOKS:**

1. 'Estimating and Costing' by B.N. Dutta, UBS publishers, 2000.
2. 'Civil Engineering Contracts and Estimates' by B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.
3. 'Construction Planning and Technology' by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. 'Estimating and Costing' by G.S. Birdie.

**REFERENCES:**

1. 'Standard Schedule of rates and standard data book' by public works department.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works – B.I.S.)
3. 'Estimation, Costing and Specifications' by M. Chakraborthi; Laxmi publications.
4. National Building Code

**IV Year – II SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

**(Elective-II)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**CE706 ( a ) - ENGINEERING WITH GEO-SYNTHETICS**

**Course Learning Objectives:**

The Objectives of the course are to impart to the student

1. An overview of the evolution of new construction materials in geotechnical engineering and to initiate geosynthetic materials.
2. Understanding the properties and the testing methods of different types of materials of gosynthetics.
3. The knowhow of manufacturing methods, uses and applications of geotextiles, geogrids, geomembranes and geocomposites.
4. The concepts of designing geosynthetics for the functions of separation, reinforcement, stabilization, filtration, drainage and moisture barriers.
5. Designing criteria of reinforced earth retaining walls, gabions, pond liners, covers for reservoirs, canal liners, landfill liners, caps and closures, dams and embankments.
6. Additional advantages of geocomposites, geowebs and geocells, and moisture barriers and natural geotextiles etc. for applications to meet various functions.

**Course Outcomes**:

At the successful completion of this course the student will be able to

4. Realize the need and demand for the use of geosynthetic materials in the field of geotechnical construction works.
5. Conduct required laboratory and field tests to obtain the properties of different materials of geosynthetics.
6. Distinguish and describe various manufacturing methods of geotextiles, geogrids, geomembranes and geocomposites.

7. Understand concepts and could design the geosynthtics for the functions of separation, reinforcement, stabilization, filtration, drainage and moisture barriers.
8. Design reinforced earth retaining walls, gabions, pond liners, covers for reservoirs, canal liners, landfill liners, caps and closures.
9. Distinguish survivability requirements of geocomposites and could design geowebs, geocells, and moisture barriers and natural geotextiles etc.

**SYLLABUS:**

**UNIT-I**

**Geosynthetics :** Introduction to Geosynthetics – Basic description – Polymeric materials– Uses and Applications. Properties of Geotextiles – Geogrids – Geomembranes – Geocomposites.

**UNIT-II**

**Geotextiles:** Design criteria for Separation – Reinforcement – Stabilization – Filtration – Drainage and Moisture barriers.
**Geogrids:** Designing for Reinforcement – Stabilization – Designing Gabions – Construction methods.

**UNIT-III**

Use of Geosynthetics in Roads: Geosynthetics in road ways- applications-role of subgrade conditions-desidn criteria-survivability-application in paved roads.

**UNIT-IV**

**Reinforced Earth Retaining Walls:** Components - External stability – Internal stability-Design of reinforced earth walls with strip, sheet and grid reinforcement.

**UNIT-V**

**Geomembranes:** Pond Liners – Covers for Reservoirs – Canal Liners – Landfill Liners– Caps and closures, moisture barriers.
**Geocomposites:** An added advantage – Geocomposites in Separation – Reinforcement – Filtration – Geocomposites as Geowebs and Geocells.

**UNIT-VI**

**Natural Geotextiles:** Natural fibres as geotextiles- factors governing the use-jute fibres-coir geotextiles-bamboo/timber-combination of geotextiles.

**TEXT BOOKS:**

1. 'Designing with Geosynthetics by Robert M. Koerner, Prantice Hall, Eaglewood Cliffs, NJ 07632.
2. 'An Introduction to Soil Reinforcement and Geosynthetics' by G.L.Sivakumar Babu (2009), Universities Press (India) Pvt. Ltd.
3. 'Engineering with Geosynthetics', by G. Venkatappa Rao and GVS Suryanarayana Raju – Tata McGraw Hill Publishing Company Limited – New Delhi.

**REFERENCES:**

1. 'Construction and Geotechnical Engineering using Synthetic Fabries' by Robert M. Koerner and Josoph P. Welsh. John Willey and Sons, New York.
2. 'Foundation Analysis and Design' by J.E. Bowles McGraw Hill Publications.

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## CE706 ( b ) -ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

**(Elective-II)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To impart knowledge on different concepts of Environmental Impact Assessment.
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIA methods.
4. To pre-requisites for ISO 14001 certification
5. To know the procedures for environmental clearances and audit
6. To appreciate the importance of stakeholder participation in EIA

**Course Learning Outcomes**

Upon successful completion of this course, the students will be able to:

a. Prepare EMP, EIS, and EIA report
b. Identify the risks and impacts of a project
c. Selection of an appropriate EIA methodology
d. Evaluation the EIA report
e. Estimate the cost benefit ratio of a project
f. Know the role of stakeholder and public hearing in the preparation of EIA

**SYLLABUS:**

**UNIT – I**

**Basic concept of EIA**: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map-Classification of environmental parameters – role of stakeholders in the EIA preparation –stages in EIA.

**UNIT – II**

**E I A Methodologies**: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP.

**UNIT-III**

**Impact of Developmental Activities and Land use**: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

**UNIT-IV**

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

**UNIT – V**

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment

**UNIT-VI**

**EIA notification by Ministry of Environment and Forest (Govt. of India):** Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

Case studies and preparation of Environmental Impact assessment statement for various Industries.

**TEXT BOOKS:**

1. Environmental Impact Assessment, Canter Larry W.,McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, Hyderabad.

**REFERENCES:**

1. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers.
2. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K. Katania & Sons Publication, New Delhi.
3. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd., Delhi.

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## CE706 ( c ) - ADVANCED STRUCTURAL ENGINEERING

**(Elective-II)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with Raft Foundations and Retaining walls.
2. Equip student with concepts of design of different types of RCC water tanks.
3. Understand Concepts of flat slabs
4. Familiarize different types of Bunkers, Silos and Chimneys.
5. Understand different types of transmission towers.

**Course Outcomes**:

At the end of this course the student will be able to

a. Design raft foundations and different types of RCC retaining walls
b. Carryout analysis and design of different types of RCC water tanks
c. Solve the problems design of RCC Bunkers, Silos and Chimneys
d. Understand various types of transmission towers and loading on them.

**SYLLABUS:**

**UNIT – I**

Analysis and Design of Raft Foundations – Design of RCC Retaining walls: Cantilever and Counter fort

**UNIT – II**

Analysis and Design of RCC Water Tanks, Circular and Rectangular types- Intze tank including staging.

**UNIT – III**

Analysis and Design of Flat Slabs- Direct Design and Equivalent Frame Methods- Check for Punching shear.

**UNIT - IV**

Analysis and Design of Bunkers and Silos- Concepts of Loading.

**UNIT-V**
Analysis and Design of Chimney, Concepts of loading

**UNIT-VI**
Introduction to Transmission Towers- Principles and procedures

**TEXT BOOKS:**

1. 'Reinforced Concrete Structures' Vol-2 by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. 'Reinforced Concrete Structures' by N. Subrahmanian, Oxford Publishers
3. 'Design Drawing of Concrete and Steel Structures' by N. Krishna Raju University Press 2005.

**REFERENCES:**

1. 'Essentials of Bridge Engineering' by D. Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. 'Reinforced concrete design' by S. U, Pillai and D. Menon, Tata Mc.Grawhill Publishing Company

**Codes**: Relevant IS: codes.

**INTERNAL EXAMINATION PATTERN:**

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

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## CE706 ( d ) - GROUND WATER DEVELOPMENT AND MANAGEMENT

**(Elective-II)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course is designed to

1. Appreciate groundwater as an important natural resource.
2. Understand flow towards wells in confined and unconfined aquifers.
3. Understand the principles involved in design and construction of wells.
4. Create awareness on improving the groundwater potential using various recharge techniques.
5. Know the importance of saline water intrusion in coastal aquifers and its control measures.
6. Appreciate various geophysical approaches for groundwater exploration.
7. Learn groundwater management using advanced tools.

**Course Outcomes**

At the end of the course the student will be able to

a. Estimate aquifer parameters and yield of wells.
b. Analyse radial flow towards wells in confined and unconfined aquifers.
c. Design wells and understand the construction practices.
d. Interpret geophysical exploration data for scientific source finding of aquifers.
e. Determine the process of artificial recharge for increasing groundwater potential.
f. Take effective measures for controlling saline water intrusion.
g. Apply appropriate measures for groundwater management.

**SYLLABUS:**

**UNIT – I**

**Introduction**

Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation.

**Well Hydraulics**

Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jocob and Chow's methods, Leaky aquifers.

**UNIT – II**

**Well Design**

Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery.

**UNIT III**

**Well Construction and Development**

Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail-down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

**UNIT IV**

**Artificial Recharge**

Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge.

**Saline Water Intrusion**

Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of saline water intrusion.

**UNIT – V**

**Geophysics**

Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications.

**UNIT – VI**

**Groundwater Modelling and Management**

Basic principles of groundwater modelling- Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

**TEXT BOOKS:**

1. ‘Groundwater’ by Raghunath H M, New Age International Publishers, 2005.
2. ‘Groundwater Hydrology’by Todd D.K., Wiley India Pvt Ltd., 2014.
3. ‘Groundwater Hydrology’by Todd D K and L W Mays, CBS Publications, 2005.

**REFERENCES:**

1. ‘Groundwater Assessment and Management’ by Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. ‘Groundwater Hydrology’ by Bouwer H, McGraw Hill Book Company, 1978.
3. ‘Groundwater Systems Planning and Management’ by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. ‘Groundwater Resources Evaluation’ by Walton W C, Mc Graw Hill Book Company, 1978.

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## CE706 ( e ) - TRAFFIC ENGINEERING

**(Elective-II)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To know various components and characteristics of traffic.
2. To know various traffic control devices and principles of highway safety.
3. To understand the detrimental effects of traffic on environment
4. To know highway capacity and level of service concepts.
5. To learn about intelligent vehicle highway systems.

**Course Outcomes:**

At the end of course, Student can

a. Determine traffic speed, volume, travel time and density.
b. Design traffic signals
c. Determine highway capacity

**SYLLABUS:**

**UNIT- I**

**Components Of The Traffic System:** Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies:Inventories; Volume studies; Speed, Travel time and Delay studies; Intersection studies; Pedestrian studies; Parking studies; Accident studies.

**UNIT- II**

**Traffic Characteristics:** Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics – Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car-following theories; Density measurement techniques; Density contour maps.

**UNIT- III**

**Traffic Control Devices & Highway Safety:** Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Webster method; ARRB method; Drew's Method; IRC method; Signal coordination; Area Traffic control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

**UNIT- IV**

**Environmental Considerations:** Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control.

**UNIT- V**

**Highway Capacity And Level Of Service:** Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards.

**UNIT- VI**

**Intelligent Vehicle – Highway Systems:** Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS.

**TEXT BOOKS**

1. 'Traffic Engineering: Theory and Practice' by Pignataro LJ., Prentice hall, Inc.
2. 'Traffic and Transport planning' by Kadiyali L.R., Khanna Publishers.

**REFERENCES:**

1. 'Traffic Engineering Hand Book' by Institute of Transportation Engineers, 4 Ed., Prentice Hall
2. 'Traffic Engineering' by Mc Shane, WR and RP Roess, Prentice Hall.
3. 'Highway Traffic analysis and design' by Salter RJ and NB Hounsell, 3rd ed., Macmillan.
4. 'Traffic Planning and Engineering' by Hobbs FD., Pergamon press
5. 'Traffic flow fundamentals' by May, AD., Prentice Hall.

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## CE706 ( f ) - INFRASTRUCTURE MANAGEMENT

**(Elective-II)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

**Infrastructure Management** focuses on the processes necessary for the planning and development of new infrastructure, and on maintaining and operating mature infrastructure for sustainability. A wide variety of management topics are covered, such as infrastructure planning, infrastructure economics, infrastructure management systems, optimal maintenance management, reliability of infrastructure systems, asset valuation and utilization, and infrastructure planning under risk and uncertainty.

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

**SYLLABUS:**

**UNIT-I**

**Performance Measures & Deterioration Modeling:**Defining performance, Common characteristics of infrastructures, Condition assessment and condition indices; Different types of deterioration models; Empirical and Mechanistic models, Markov and Semi-Markov models, Risk-based deterioration modeling

**UNIT-II**

**PRIORITIZATION AND MAINTENANCE PLANNING & POLICY:**Needs Analysis, Ranking by single criteria, Ranking by fixed and variable trigger points,Single/multiple-year prioritization; Different types of maintenance planning, Maintenance policy.

**UNIT-III**

**INFRASTRUCTURE ECONOMICS:**Costs and benefits, Trade-off Analysis, Cost-effectiveness technique and Budget allocation.

**UNIT-IV**

**OPTIMIZATION:** Objective functions, decision variables and constraints, Optimization techniques, Optimal maintenance planning.

**UNIT-V**

**Asset Management System:** Management System, Components of Asset Management System.

**UNIT-VI**

**Tools and Technology:** Destructive Testing, Nondestructive Testing, Database Management System for Inventory Data Control, Other Information Technology.

**TEXT BOOKS:**

1. 'Infrastructure Management' by Hudson, Haas and Uddin, McGraw-Hill, 1997.
2. 'Infrastructure Engineering and Management'Grigg, N., John Wiley & Sons, 1998.
3. 'Infrastructure Condition: Art, Science and Practice' by Saito, M., ASCE, 1997.

**REFERENCES:**

1. 'Markov Chains' by Norris, J. R., Cambridge University Press, 1997.
2. 'Pavement Management for Airports, Roads and Parking Lots' by Kluwer, Shahin M, Kluwer Academic Publisher, 1994.

**IV Year – II SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

**(Elective-III)**

## CE803 ( a ) - ADVANCED FOUNDATION ENGINEERING

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To enable the student to appreciate how Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation.
2. To teach the student special methods of computation of settlements and the corrections to be applied to settlements.
3. To enable the student to understand the advanced concepts of design of pile foundations.
4. To teach the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.
5. To enable the student to learn the difference between isolated and combined footings, the determination of bearing capacity of mats and proportioning of footings.

**Course Outcomes**:

Upon successful completion of this course, student will be able to

a. Compute the safe bearing capacity of footings subjected to vertical and inclined loads.
b. Understand the advanced methods of settlement computations and proportion foundation footings.
c. Appreciate the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.
d. Appreciate the problems posed by expansive soils and the different foundation practices devised.
e. Appreciate the difference between isolated footings and combined footings and mat foundations.

**SYLLABUS:**

**UNIT-I**

Bearing capacity of Foundations using general bearing capacity equation – Meyerhof's, Brinch Hansen's and Vesic's methods.

**UNIT-II**

Settlement analysis: Immediate settlement of footings resting on granular soils – Schmertmann & Hartman method – De Beer and Martens method - Immediate settlement in clays – Janbu's method – correction for consolidation settlement using Skempton and Bjerrum's method – Correction for construction period.

**UNIT-III**

Mat foundations – Purpose and types of isolated and combined footings – Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils – compensated rafts.

**UNIT-IV**

Earth-retaining structures – cantilever sheet piles – anchored bulkheads – fixed and free earth support methods – design of anchors – braced excavations – function of different components – forces in ties – stability against bottom heave.

**UNIT-V**

Pile foundations – single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

**UNIT-VI**

Foundations in expansive soils – definitions of swell potential and swelling pressure – determination of free swell index – factors affecting swell potential and swelling pressure – foundation practices – sand cushion method – CNS layer - drilled piers and belled piers – under-reamed piles – moisture control methods.

**TEXT BOOKS:**

1. 'Basic and applied soil mechanics' by Gopal Ranjan and ASR Rao, New Age Publishers.

2. ‘Soil Mechanics and Foundation Engineering’ by VNS Murthy, CBS Publishers.
3. ‘Principles of Foundation Engineering’ by BM Das, Thomson Brooks/Cole.

**REFERENCE BOOKS:**

1. ‘Foundation Analysis and Design’ by JE Bowles, John Wiley.
2. ‘Foundation Design’ by WC Teng, Prentice Hall Publishers.

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## CE803 ( b ) - SOLID WASTE MANAGEMENT

**(Elective-III)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.
2. To acquire the principles of treatment of municipal solid waste
3. To know the impact of solid waste on the health of the living beings
4. To learn the criterion for selection of landfill and its design
5. To plan the methods of processing such as composting the municipal organic waste.

**Course Learning Outcomes**

Upon successful completion of this course, the students will be able to:

a. Design the collection systems of solid waste of a town
b. Design treatment of municipal solid waste and landfill
c. To know the criteria for selection of landfill
d. To characterise the solid waste and design a composting facility

**SYLLABUS:**

**UNIT- I**

**Introduction to Solid Waste Management**: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

**UNIT- II**

**Basic Elements In Solid Waste Management:** Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

**Collection of Solid Waste**: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

**UNIT- III**

**Transfer and Transport**: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

**UNIT- IV**

**Separation and Transformation of Solid Waste**:unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization.

**UNIT- V**

**Processing and Treatment**: Processing of solid waste - Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

**UNIT- VI**

**Disposal of Solid Waste**: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

**TEXT BOOKS**

1. George Techobanoglous "Integrated Solid Waste Management", McGraw Hill Publication, 1993

**REFERENCES**

1. Vesilind, P.A., Worrell, W., Reinhart, D. "Solid Waste Engineering", Cenage learning, New Delhi, 2004
2. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.

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## CE803 ( c ) - EARTHQUAKE RESISTANT DESIGN

**(Elective-III)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with Engineering Seismology
2. Equip student with concepts of Structural Dynamics
3. Understand Concepts of Seismic Design
4. Familiarize with Design philosophies for Seismic loading
5. Familiarize students with various IS codal provisions for ductile design and detailing

**Course Outcomes**:

At the end of this course the student will be able to

a) Explain fundamentals of Engineering Seismology
b) Acquaint with the principles Structural dynamics
c) Solve SDOF Systems and suggest ductile design
d) Compute equivalent lateral seismic loads and carryout a seismic design as per IS codal provisions

**SYLLABUS:**

**UNIT-I**

**Engineering seismology** – rebound theory – plate tectonics – seismic waves - Earthquake size and various scales – local site effects – Indian seismicity – seismic zones of India – theory of vibrations – near ground and far ground rotation and their effects.

**UNIT-II**

**Introduction to Structural Dynamics:** Fundamental objective of Dynamic analysis – Types of prescribed loadings – Formulation of the Equations of Motion– Elements of a Vibratory system – Degrees of Freedom - Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor.

**UNIT-III**

Seismic design concepts – EQ load on simple building – load path – floor and roof diaphragms – seismic resistant building architecture – plan configuration – vertical configuration – pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic code (IS 1893 & 13920) – Building system – frames – shear wall – braced frames – layout design of Moment Resisting Frames (MRF) – ductility of MRF – Infill wall – Non-structural elements.

**UNIT-IV**

Calculation of equivalent lateral force- Design Base Shear- Storey Shear, Estimation of Natural period of Structure, Computation of Response acceleration Coefficient- Zone factor- Seismic weight- Response reduction factors- Seismic Coefficient Method.

**UNIT-V**

Design and ductile detailing of Beams and columns of frames -Concept of strong column weak beams, Ductility criteria for earthquake resistant design, Ductile detailing of flexural members as per IS 13920- Longitudinal reinforcement, Shear reinforcement, Anchorage of reinforcement- Development length, Lap Splices.

**UNIT-VI**

Seismic Analysis and design of simple 2-storied RC Building frame – Equivalent static lateral force method and response spectrum method.

**TEXT BOOK**

1. ‘Earthquake Resistant Design of Structures’ -Pankaj Agarwal and Manish ShriKhande, Prentice – Hall of India, 2007, New Delhi.
2. ‘Earthquake Resistant Design of Building Structures’ by Vinod Hosur, Wiley India Ltd.
3. ‘Reinforced Concrete Design’by A. K. Jain.

**REFERENCES**

1. ‘Introduction to the Theory of Seismology’ by Bullen K.E., Great Britain at the University Printing houses, Cambridge University Press 1996.
2. Relevant code of practices.

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## CE803 ( d ) - WATERSHED MANAGEMENT

**(El3ective-III)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course is designed to:

1. introduce the concept of watershed management
2. understand the watershed characteristics
3. learn the principles of soil erosion and measures to control erosion
4. appreciate various water harvesting techniques.
5. learn land management practices for various land use/land cover.
6. introduce concepts of watershed modelling.

**Course outcomes**

At the end of the course the student will be able to

a. calculate watershed parameters and analyse watershed characteristics to take appropriate management action.
b. quantify soil erosion and design control measures.
c. apply land grading techniques for proper land management .
d. suggest suitable harvesting techniques for better watershed management.
e. apply appropriate models for watershed management.

**SYLLABUS:**

**UNIT-I**

**Introduction:** Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

**UNIT-II**

**Characteristics of Watersheds:** Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

**UNIT-III**

**Principles of Erosion:** Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation.

**Measures to Control Erosion:** Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams , rock-fill dams, brushwood dam, Gabion.

**UNIT-IV**

**Water Harvesting:** Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

**UNIT-V**

**Land Management:** Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

**UNIT-VI**

**Watershed Modelling:** Data of watershed for modelling, application and comparison of watershed models, model calibration and validation, advances of watershed models.

**TEXT BOOKS:**

1. 'Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.
2. 'Land and Water Management' by Murthy.VVN, Kalyani Publications, 2007.
3. 'Watershed Management' by Murthy J V S, New Age International Publishers, 2006.

**REFERENCES:**

1. 'Water Resource Engineering'by Wurbs R A and James R A, Prentice Hall Publishers, 2002.
2. 'Watershed Hydrology' by Black P E, Prentice Hall, 1996.

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## CE803 ( e ) - PAVEMENT ANALYSIS AND DESIGN

**(Elective-III)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To know various factors affecting pavement design
2. To know various concepts for the stresses in pavements.
3. To understand material characterisation and mix design concepts.
4. To acquire design principles of flexible and rigid pavements.
5. To acquire design principles of shoulders, overlays and drainage.

**Course Outcomes:**

At the end of course, Student can

a. Design flexible and rigid pavements using various methods
b. Design shoulders, overlays and drainage.

**SYLLABUS:**

**UNIT-I**

**Factors Affecting Pavement Design:** Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

**UNIT-II**

**Stresses In Pavements:** ***Vehicle-Pavement Interaction:***Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements; ***Stress in Flexible Pavements:*** Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts; ***Stresses in Rigid Pavements:***Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars, Introduction to DAMA, KENLAYER & KENSLABS Programs.

**UNIT-III**

**Material Characterisation & Mix Design Concepts:** CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilisation and Use of Geo Synthetics; Marshall's and Hveem's Methods of Bituminous Concrete Mix Design, Field Implications of Stability and Flow Values, Introduction to Super Pave Mix Design, IRC Cement Concrete Mix Design.

**UNIT-IV**

**Design of Flexible Pavements:** Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, Road Note No 29 & IRC Methods, Design of Runways & Taxiways, Design of Low Volume Rural Roads.

**UNIT-V**

**Design Of Rigid Pavements:** Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design, Rigid Pavement Design for Low Volume Rural Roads.

**UNIT-VI**

**Design Of Shoulders, Overlays & Drainage:** Shoulder Design Considerations, Traffic Prediction, Parking, Regular & Encroaching Traffic, Thickness Design Specifications for Flexible & Rigid Shoulders; Types & Design of Overlays: AI's Principal Component Analysis & IRC Methods of Overlay Design, Importance of Profile Correction Course; Pavement Drainage Concepts, Drainage Related Failures, Inflow-Outflow Concepts, Condition of Continuity, Surface and Sub Surface Drainage Design Specifications.

**TEXT BOOKS:**

1. 'Pavement Analysis and Design' by Yang H. Huang, Pearson Education, Second Edition.
2. 'Principles of Pavement Design' by Yoder.J. & Witczat Mathew, W. John Wiley & Sons Inc.
3. 'Pavement Design' by Srinivasa Kumar R, Universities Press, Hyderabad.

**REFERENCES:**

1. ‘Design of Functional Pavements’ by Nai C. Yang, McGraw Hill Publications.
2. ‘Concrete Pavements’ by AF Stock, Elsevier, Applied Science Publishers.
3. ‘Pavement and Surfacings for Highway & Airports’ by Micheal Sargious, Applied Science Publishers Limited.
4. ‘Dynamics of Pavement Structures’ by G. Martineek, Chapmen & Hall Inc.
5. ‘Principles of Transportation Engineering’ by Patha Chakroborty and Animesh Das, PHI Learning Private Limited, Delhi.

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## CE803 ( f ) - GREEN BUILDINGS

**(Elective-III)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

**Course Outcomes**:

Upon the successful completion of this course, the students will be able to:

**SYLLABUS:**

**UNIT-I**

**Green Buildings:** Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings- Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage

**UNIT- II**

**Environmentally friendly building materials and technologies:** Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, ferro-cement and ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc.

**UNIT - III**

**Energy and resource conservation**: Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes- water conservation systems in buildings-water harvesting in buildings – waste to energy management in residential complexes or gated communities.

**UNIT- IV**

**Use of renewable energy resources:** Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar appliances, success case studies of fully solar energy based buildings in India.

**UNIT- V**

**Climate Design:** Local climatic conditions – temperature, humidity, wind speed and direction-impact of climate change on built environment - comforts: the desirable conditions – Principles of thermal design - means of thermal –light and lighting-building acoustics- energy efficient lighting, Ventilation and air quality requirement, various techniques for passive cooling, garden roofs, case studies for passive cooling and thermal comfort.

**UNIT- VI**

**Green Building Rating Systems:** Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment - Modular wastewater treatment systems for built environment - Building automation and building management systems.

**TEXT BOOKS:**

1. ‘Alternative building materials and technologies’ by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.
2. ‘Non-Conventional Energy Resources’ by G. D. Rai, Khanna Publishers.

**REFERENCES:**

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**IV Year – II SEMESTER**

| T | P | C |
|---|---|---|
| 3+1* | 0 | 3 |

**(Elective-IV)**

## CE804 ( a ) - SOIL DYNAMICS AND MACHINE FOUNDATIONS

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The basic course in soil mechanics/geotechnical engineering generally introduces the fundamental concepts, principles and applications of soil as engineering material with properties under static loading.

This course on 'Soil Dynamics' discusses

1. About the fundamentals of vibrations
2. about the behaviour and properties/response of soil as a material which is subjected to various types of dynamic or cyclic time-dependent loadings.
3. the design and analysis for machine foundations come along with this course to consider the dynamic properties of both soil and foundation as combined mass. Behaviour of various geotechnical structures such as shallow and deep foundations, retaining structures due to various types of time-dependent dynamic loading are discussed here along with the reference to design code provisions.
4. Phenomena like liquefaction and lateral spreading of soil are also discussed.
5. Discusses about the laboratory and filed tests to compute the dynamic soil properties of the soil mass.

**Course Outcomes:**

On successful completion of these course, the student able to

a. Use theory of vibrations to find the behavior of soil under dynamic loading.
b. Design machine foundations under different loads and soil conditions.
c. Understand the liquefaction phenomina.
d. Conduct various laboratory and filed tests to determine the dynamic soil prosperities and its interpretation.

e. Design vibration isolators under any vibratory machines.

**SYLLABUS:**

**UNIT-I**

Introduction: Types of motion- SHM- Fundamental definitions- SDOF systems- Free and forced vibration with and without damping - Constant force and rotating mass type excitation –Types of damping-Equivalent stiffness of springs in series and parallel. – Resonance and its effect - magnification-logarithmic decrement –Transmissibility.

**UNIT-II**

Theories of Vibration Analysis- EHS Theory and lumped parameter model- Different modes of vibration- Natural frequency of foundation soil system – Barkan and IS methods – Pressure bulb concept – Reisner Theory – Limitations of Reisner theory – Sung's solutions -- Pauw's Analogy – Heigh's Theory.

**UNIT-III**

Dynamic properties of soils, Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes- Stress waves in bounded elastic medium- Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests.– Block vibration test – Determination of Damping factor.

**UNIT-IV**

Types of machine foundations – general requirements design – criteria for machine foundations, permissible amplitudes and bearing pressure
Design data, design criteria, IS code provisions for the design foundations of reciprocating machines.

**UNIT-V**

Design data, design criteria, IS code provisions for the design foundations of Impact type of machines.

**UNIT-VI**

Vibration Isolation: Transmissibility, Principles of isolation- Methods of isolation- Vibration isolators- Types and their characterizes
Special Topics: Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction - Dynamic bearing capacity, Earth retaining structures under dynamic loads.

**TEXT BOOK:**

1. ‘Vibrations of Soils and Foundations’by Richart Hall and Woods

**REFERENCES:**

1. ‘Vibration Analysis and Foundation Dynamics’by NSV Kameswara Rao, Wheeler Publishing, New Delhi.
2. ‘Foundations of Machines- Analysis and Design’ by Prakash and Puri.
3. ‘Analysis and design of Foundations for Vibrations’ by P J Moore
4. ‘Fundamentals of Soil Dynamics’ by B M Das
5. ‘Dynamics of bases and Foundations’ by D D Barkar

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## CE804 ( b ) - ENVIRONMENTAL AND INDUSTRIAL HYGIENE

**(Elective-IV)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To provide with information regarding Occupational health, Hygiene, workplace safety.
2. To make aware of regulations, codes of practice in industrial hygiene.
3. To impart basic knowledge on industrial fatigue and ergonomics.
4. To know the basic right of an employee on safety aspects.

**Course Learning Outcomes**

Upon successful completion of this course, the students will be able to:

1. Identify aspects related to occupational health, Hygiene, workplace safety in an industry.
2. Know the regulations, codes of practice available with reference to industrial hygiene.
3. Enlist the common points related to ergonomics.
4. Know the safety equipment and the basic right of an employee on safety aspects.

**SYLLABUS:**

**UNIT- I**

**Introduction:** Need for developing Environment, Health and Safety systems in work places. Status and relationship of Acts, Regulations and Codes of Practice. Role of trade union safety representatives.

**UNIT- II**

**Occupational Health and Hygiene:** Definition of the term occupational health and hygiene. Categories of health hazards. Exposure pathways and human responses to hazardous and toxic substances. Advantages and limitations of environmental monitoring and occupational exposure limits. Hierarchy of control measures for occupational health risks. Control methods and reduction strategies for noise, radiation and excessive stress. OHSAS.

**UNIT- III**

**Workplace Safety and Safety Systems:** Features of the satisfactory design of work premises, ventilation. Safe installation and use of electrical supplies.

Fire safety and first aid provision. Significance of human factors in the establishment and effectiveness of safe systems. Safe systems of work for manual handling operations. Control methods to eliminate or reduce the risks arising from the use of work equipment. Requirements for the safe use of display screen equipment. Procedures and precautionary measures necessary when handling hazardous substances- Contingency arrangements for events of serious and imminent danger.

**UNIT -IV**

**Techniques of Environmental Safety:** Methods of effective implementation and review of health & safety policies. Functions and techniques of risk assessment, Investigation of accidents- Principles of quality management systems in health and safety management.

**UNIT- V**

**Industrial Fatigue and Ergonomics**:

Fatigue: Types of fatigue - circadian rhythms- sleep cycle-sleep debt-effects of fatigue-factors contributing to fatigue- mitigation of fatigue.

Ergonomics: definition-boundaries of ergonomics- objectives and principles of ergonomics-ergonomics relation with health and safety-ergonomics problems in work place-ergonomics improvements-identification of poor posture and risks.

**UNIT- VI**

**Education and Training:** Relationship between quality manuals, safety policies and written risk assessments. Records and other documentation required by an organisation for health and safety. Principles and methods of effective training- Feedback and evaluation mechanism.

**TEXT BOOKS:**

**REFERENCES:**

1. ‘Environmental and Health and Safety Management’ by Nicholas P. Cheremisinoff and Madelyn L.Graffia, William Andrew Inc. NY, 1995
2. ‘The Facility Manager's Guide to Environmental Health and Safety’ by Brian Gallant, GovernmentInst Publ., 2007.
3. ‘Effective Environmental, Health, and Safety Management Using the Team Approach’ by BillTaylor, Culinary and Hospitality Industry Publications Services 2005.

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## CE804 ( c ) - REPAIR AND REHABILITATION OF STRUCTURES

**(Elective-IV)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with deterioration of concrete in structures
2. Equip student with concepts of NDT and evaluation
3. Understand failures and causes for failures in structures
4. Familiarize different materials and techniques for repairs
5. Understand procedure to carryout Physical evaluation of buildings and prepare report.

**Course Outcomes**:

At the end of this course the student will be able to

a. Explain deterioration of concrete in structures
b. Carryout analysis using NDT and evaluate structures
c. Assess failures and causes of failures in structures
d. Carryout Physical evaluation and submit report on condition of the structure.

**SYLLABUS:**

**UNIT - I**

**Deterioration of concrete in structures:** Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes, Mechanism, Effect, preventive measures. - Cracks:Cracks in concrete, type, pattern, quantification, measurement & preventive measures.

**UNIT- II**

**Non Destructive Testing-** Non destructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting-Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

**UNIT-III**

**Failure of buildings:** Definition of building failure-types of failures- Causes of Failures- Faulty Design, Accidental over Loading, Poor quality of material and Poor Construction practices- Fire damage - Methodology for investigation of failures-diagnostic testing methods and equipments-repair of cracks in concrete

**UNIT-IV**

Materials for repair and rehabilitation -Admixtures- types of admixtures- purposes of using admixtures- chemical composition- Natural admixtures- Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

**UNIT: V**

**Repair Techniques**: Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes.

**UNIT: VI**

**Investigation of structures**: Distress, observation and preliminary test methods. Case studies: related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures.

**TEXT BOOKS:**

1. ‘Maintenance & Repair of Civil Structures’ by B.L. Gupta & Amit Gupta.
2. ‘Rehabilitation of Concrete Structures’ by B. Vidivelli, Standard Publishers.
3. ‘Concrete Bridge Practice Construction, Maintenance & Rehabilitation’ by V. K. Raina.

**REFERENCES:**

1. ‘Concrete Structures- protection Repair and Rehabilitation’ by R. Doodge Woodson, BH Publishers

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## CE804 ( d ) - WATER RESOURCES SYSTEM PLANNING AND MANAGEMENT

**(Elective-IV)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The course is designed to

1. introduce the concepts of system analysis in the planning, design, and operation of water resources.
2. appreciate mathematical optimization methods and models.
3. learn and apply basic economic analysis tools to water resources projects.
4. understand linear, nonlinear and dynamic programming techniques and apply them to various water resources systems planning and design problems.
5. appreciate simulation and management techniques in water resources systems.

**Course Outcomes**

At the end of the course the student will be able to

a. apply optimization methods to solve problems related to water resource systems.
b. perform basic economic analysis to evaluate the economic feasibility of water resources projects
c. formulate optimization models for decision making in water resources systems.
d. use simulation models for planning and design of Water Resources Systems.

**SYLLABUS:**

**UNIT – I**

**Introduction:** Concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

**UNIT – II**

**Linear programming:** Formulation of linear programming models, graphical method, simplex method, application of linear programming in water resources, revised simplex method, duality in linear programming, sensitivity analysis.

**UNIT – III**

**Dynamic programming:** Principles of optimality, forward and backward recursive dynamic programming, curse of dimensionality, application for resource allocation.

**UNIT – VI**

**Non-linear optimization techniques:**Classical optimization techniques, Lagrange methods, Kuhn-Tucker conditions, Search techniques, overview of Genetic Algorithm

**UNIT – V**

**Water Resources Economics: B**asics of engineering economics, economic analysis, conditions of project optimality, benefit and cost analysis

**UNIT – VI**

**Simulation and management:** Application of simulation techniques in water resources, planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources.

**TEXT BOOKS:**

1. 'Water Resources System Analysis' by Vedula S and P P Mujumdar, McGraw Hill Company Ltd, 2005.
2. 'Water Resources Economics' by James D and R. Lee, Oxford Publishers, 2005.

**REFERENCES:**

1. 'Water Resources Systems Planning and Management - An Introduction to Methods, Models and Applications'by Loucks D P and E V Bee,UNESCO Publications, 2005 (http://ecommons.cornell.edu/bitstream/1813/2804/21/00_intro.pd)
2. 'Optimal design of water distribution networks' by Bhave, P. R, Narosa Publishing house, 2003.

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## CE804 ( e ) - URBAN TRANSPORTATION PLANNING

**(Elective-IV)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. To learn various procedures for travel demand estimation .
2. To various data collection techniques for OD data.
3. To know various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
4. To develop alternative urban transport network plans.

**Course Outcomes:**

At the end of course, Student can

a. Estimate travel demand for an urban area.
b. Plan the transportation network for a city.
c. Identify the corridor and plan for providing good transportation facilities.
d. Evaluate various alternative transportation proposals.

**SYLLABUS:**

**UNIT -I**

**Urban Transportation Problems & Travel Demand:** Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

**UNIT -II**

**Data Collection And Inventories:** Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

**UNIT -III**

**Trip Generation & Distribution:**UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

**UNIT -IV**

**Mode Choice Analysis:**Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

**UNIT -V**

**Traffic Assignment:**Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

**UNIT -VI**

**Corridor Identification, Plan Preparation & Evaluation:** Master plans, Selection of Corridor, Corridor Identification, Corridor deficiency Analysis; Travel Forecasts to Evaluate Alternative Improvements, Impacts of New Development on Transportation Facilities. Pivot Point Analysis, Environmental and Energy Analysis; Case studies

**TEXT BOOKS:**

1. ‘Introduction to Urban System Planning’ by Hutchinson, B.G., McGraw Hill.
2. ‘Transportation Engineering - An Introduction’ by Khisty C.J., Prentice Hall.
3. ‘Fundamentals of Transportation Planning’ by Papacostas, Tata McGraw Hill.

**REFERENCES:**

1. ‘Urban Transportation Planning: A decision oriented Approach’ by Mayer M and Miller E, McGraw Hill.
2. ‘Introduction to Transportation Planning’ by Bruton M.J., Hutchinson of London.
3. ‘Metropolitan Transportation Planning’ by Dicky, J.W., Tata McGraw Hill.
4. ‘Traffic Engineering and Transportation Planning’ by Kadiyali.L.R., Khanna Publishers, New Delhi.

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## CE804 ( f ) - SAFETY ENGINEERING

**(Elective-IV)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | 30 Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | 70 Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

1. To import concepts of safety w.r.t construction Industry
2. To understands various hazards in construction industry and preventive measures
3. To learn safety operation of construction machinery
4. To learn techniques to distinguish civil structures safety
5. To understand fire safety principles

**Course Outcomes**:

Students will have ability to

a. Develop management plans to prevent accidents in construction industry.
b. Prepare plans to safe guard workers in construction of high risk buildings.
c. Ensure safety while operating construction machinery
d. Outline safety plans for demolition of buildings
e. Prepare fire safety plans for a given building

**SYLLABUS:**

**UNIT-I**

**Accidents Causes And Management Systems :**Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident – construction regulations, contractual clauses – Pre contract activates, preconstruction meeting - design aids for safe construction – permits to work – quality assurance in construction - compensation – Recording of accidents and safety measures – Education and training.

**UNIT-II**

**Hazards Of Construction And Prevention :**Excavations, basement and wide excavation, trenches, shafts – scaffolding , types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work,

dismantling – tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water - road works – power plant constructions – construction of high rise buildings.

**UNIT-III**

**Working At Heights:**Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings , requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection , safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.

**UNIT-IV**

**Construction Machinery :**Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder's hoist, winches, chain pulley blocks – use of conveyors - concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes – manual handling.

**UNIT-V**

**Safety In Demolition Work :**Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods – interesting experiences at the construction site against the fire accidents.

**UNIT-VI**

**Fire Safety:** Fire –fire load-control and institutional fire protection systems, Fire Hydrant and extinguishers, Electrical Hazards, protection and interlock-Discharge rod and earthling device, safety in the use of portable tools. Emergency planning and preparedness. Marking of Route Fire Exist.

**TEXT BOOKS:**

1. 'Safety in the Build Environment' by Jnathea D.Sime, London, 1988.
2. 'Reliability Maintenance and Safety Engineering, by Gupta A K, Laxmi Publications, New Delhi.

3. ‘Safety Management’ by John V. Grimoldi, AITBS Publishers and Distributors, New Delhi.

**REFERENCES:**

1. ‘Construction hazard and Safety Hand book’ by Hudson, R., Butter Worth’s, 1985.
2. ‘Construction Safety Hand Book’by V.J.Davies and K.Thomasin, Thomas Telford Ltd., London, 1990.
3. ‘Handbook of OSHA Construction Safety and Health’by Charles D. Reese & James V. Edison.

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## CE804 ( g ) - BRIDGE ENGINEERING

**(Elective-IV)**

| | | | |
|---|---|---|---|
| Lecture : | 3 hrs/Week | Internal Assessment : | 30 Marks |
| Tutorial : | 1 Hrs/Week | Semester End Examination : | 70 Marks |
| Practical : | -- | Credits : | 3 |

**Course Learning Objectives:**

The objective of this course is:

1. Familiarize Students with different types of Bridges and IRC standards.
2. Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts.
3. Understand concepts of design of Plate Girder Bridges
4. Familiarize with different methods of inspection of bridges and maintenance.

**Course Outcomes**:

At the end of this course the student will be able to

a. Explain different types of Bridges with diagrams and Loading standards
b. Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing
c. Carryout analysis and design of Plate girder bridges
d. Organize for attending inspections and maintenance of bridges and prepare reports.

**SYLLABUS:**

**UNIT-I**

Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading.

**UNIT-II**

Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of

slab- Guyon's – Massonet Method –Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method.

**UNIT-III**

T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing.

**UNIT-IV**

**Plate Girder Bridges**: Elements of plate girder and their design-web- flange-intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

**UNIT-V**

**Box Culverts:** Loading –Analysis and Design- Reinforcement detailing.

**UNIT-VI**

**Inspection and Maintenance of Bridges:** Procedures and methods for inspection – Testing of bridges- Maintenance of Sub Structures and Superstructures- Maintenance of bearings- Maintenance Schedules.

**TEXT BOOK**

1. 'Essentials of Bridge Engineering' by Jhonson Victor D
2. 'Design of Bridge Structures' by T. R. Jagadeesh, M.A. Jayaram, PHI
3. 'Design of RC Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications.

**REFERENCES:**

1. 'Design of Concrete Bridges' by Aswini, Vazirani, Ratwani.
2. 'Design of Steel Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications.
3. 'Design of Bridges' by Krishna Raju.

**INTERNAL EXAMINATION PATTERN:**

The total internal marks (30) are distributed in three components as follows:

1. Descriptive (subjective type) examination : 25 marks
2. Assignment : 05 marks

**FINAL EXAMINATION PATTERN:**

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

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**IV Year – II SEMESTER**

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|---|---|---|
| 0 | 0 | 9 |

**Project Work**

**CE805-PROJECT WORK**

| | | | |
|---|---|---|---|
| Contact Hours : | 9 hrs/Week | Internal Assessment : | 60 Marks |
| Tutorial : | --- | Semester End Examination : | 140 Marks |
| Practical : | --- | Credits : | 9 |

**The main objective of the Project work is**

a. To enable the student apply engineering knowledge that has been taught all through the programme for solving practical engineering problem.
b. To enable the student capable for prblem solving / problem shooting.
c. To instill and inculcate team spirit/ team work in to the minds of the students.
d. To enable/ train the students report making/ documnetation.
e. To provide students an opportunity to use any civil engineering software for their project work.

**Out comes of the Project work.**

Up on completion of the Project work, the student will be able to

1. Apply all levels of Engineering knowledge in solving the Engineering problems.
2. Work together with team spirit.
3. Use Civil Engineering software at least one.
4. Document the projects