



# **GOVERNMENT COLLEGE OF TECHNOLOGY**

(An Autonomous Institution Affiliated to Anna University)

Coimbatore - 641 013

**Curriculum & Syllabi (I - VII SEM)**

**B.E. (CIVIL ENGINEERING)**

(Part Time)

# **2012**

**Regulations**

**OFFICE OF THE CONTROLLER OF EXAMINATIONS  
GOVERNMENT COLLEGE OF TECHNOLOGY  
THADAGAM ROAD, COIMBATORE - 641 013**

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# Regulations



**Regulations for Part Time candidates admitted during the academic year  
2012 - 2013 and onwards**

**1. CONDITIONS FOR ADMISSION**

Candidates for admission to the first year of the Part Time - Seven Semester B.E. Degree course shall be required to have passed,

- i. the Diploma Examination in Engineering conducted by the State Board of Technical Education and Training, Tamil Nadu.

(or)

- ii. an Examination of any University or Authority, accepted by the Syndicate of the Anna University as equivalent thereto.

(or)

- iii. any other examination as notified by the Government of Tamil Nadu.

Any other conditions as notified by the Government of Tamil Nadu.

**2. BRANCHES OF STUDY**

Branches will be offered at the time of admission to the course. The following are the branches offered in this college.

- 1. B.E. Civil Engineering
- 2. B.E. Mechanical Engineering
- 3. B.E. Electrical and Electronics Engineering
- 4. B.E. Electronics and Communication Engineering

**3. STRUCTURE OF PROGRAMMES**

3.1 Every programme shall have a curriculum with well – defined syllabi comprising of both theory and practical courses such as :

- i. General core subjects comprising Mathematics, Basic Sciences, Engineering Sciences, Humanities and Engineering arts.
- ii. Core subjects of Engineering / Technology
- iii. Elective subjects for specialization in related field.
- iv. Workshop practice, computer practice, engineering graphics, laboratory work, industrial training, seminar presentation, project work, educational tours, camps etc.

3.2 The subjects of study shall be both theory and practical and shall be in accordance with the prescribed syllabus.

3.3 Each semester curriculum shall normally have a blend of lecture and practical subjects not exceeding 5.

3.4 A student who has passed all the subjects prescribed in the curriculum for the award of the

degree shall not be permitted to re-enroll to improve his/her **credits** in a subject or the aggregate **credits**.

3.5 The medium of instruction in examinations and project report shall be English.

#### 4. DURATION OF THE PROGRAMME

The duration of the programme for the Degree of B.E. Programme shall be SEVEN (7) semesters with semester pattern: The number of working days will be 90 days (which includes 15 days for end semester examinations) or 450 Hours or 540 periods of each 50 minutes duration for semester pattern. The number of working days is to be calculated excluding study holidays, Government holidays and end - semester examination days. The Head of the Department shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

#### 5. SYSTEM OF EXAMINATION

Performance in each subject of study shall be evaluated based on (i) continuous internal assessment through the semester and (ii) an end semester examination.

##### **THEORY**

End semester Examinations will be conducted in all the theory subjects of study at the end of each semester for all the subjects. The maximum marks of each subject shall be 100, out of which the continuous internal assessment will carry 25 marks, while the end semester Examination will carry 75 marks.

To arrive the internal mark the following guidelines are to be followed.

|                  |   |            |
|------------------|---|------------|
| (i) Test         | (3 Nos.) { each test is to be conducted for 50 Marks} | : 60 Marks |
| (ii) Assignment  | (3 Nos.)  | : 30 Marks |
| (iii) Attendance |   | : 10 Marks |
|                  |   | <hr/>      |
|                  |   | 100 Marks  |

Total 100 Marks should be reduced to 25 Marks

##### \* Attendance (10 Marks)

| Percentage of attendance | Marks |
|--------------------------|-------|
| 75                       | 0     |
| 76 - 80                  | 2     |
| 81 - 84                  | 4     |
| 85 - 89                  | 6     |
| 90 - 94                  | 8     |
| 95 and above             | 10    |

##### **PRACTICAL**

The Practical classes for all the Practical / Lab component subjects will be assessed continuously and marks will be entered in the prescribed proforma. The progress of Practical classes will be monitored by a committee formed by the concerned Head of the Departments / Professor in-charge of the Programme to ensure that the concerned staff conducts the laboratory experiments as specified in the syllabus. The proforma should be submitted at the end of the each month for Principal's / Chairman, Board of Examinations' approval. The maximum marks for the Practical / Lab component subjects shall be 100, out of which the continuous internal assessment

will carry 25 marks, while the end semester practical examination will carry 75 marks. If any practical subject contains Part A and Part B components, the maximum marks for each Part of the lab will be 50 marks, out of which the continuous internal assessment will carry 12.5 marks, while the end semester practical examination will carry 37.5 marks. The award of the end semester practical examination marks shall be conducted by both the Internal and External examiners. To arrive the internal mark the following guidelines are to be followed.

- |                           |            |
|---------------------------|------------|
| (i) Continuous Assessment | : 50 Marks |
| (ii) Test (minimum one)   | : 40 Marks |
| (iii) Attendance          | : 10 Marks |

Total 100 Marks should be reduced to 25 Marks

Attendance (10 Marks )

| Percentage of attendance | Marks |
|--------------------------|-------|
| 75                       | 0     |
| 76 - 80                  | 2     |
| 81 - 84                  | 4     |
| 85 - 89                  | 6     |
| 90 - 94                  | 8     |
| 95 and above             | 10    |

#### PROJECT WORK AND VIVA - VOCE :

For the project work and viva-voce examination the maximum marks shall be 200 comprising of 50 marks for internal assessment and 150 for the end semester examination. The award of the end semester marks for 150 shall be evaluated by both the Internal and External examiners, out of which the project report shall carry a maximum of 50 marks (same mark must be awarded to every student of the project group) while the viva-voce examination shall carry 100 marks (awarded to each student of the project group based on the individual performance in the viva-voce examination).

For Internal Mark:

- |                                     |               |
|-------------------------------------|---------------|
| Work assessed by Guide / Supervisor | : 50 % weight |
| Work assessed by a Committee        | : 50 % weight |

#### 6. REQUIREMENTS OF EXAMINATIONS AND ATTENDANCE

A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester.

6.1 A candidate will be permitted to appear for the Examination for any semester, only if

- i. he / she secures not less than 75% of attendance in the number of working days during that semester, provided that it shall be open to Chairman of the Academic Council or any authority delegated with such powers (by the governing body) to grant exemption (based on the recommendation of the Head of the Department ) to a candidate who has failed to secure 75% of the attendance for valid reasons and has secured not less than 66% of the attendance. Such exemptions can be allowed only TWO times during his/ her entire period of study.
- ii. Candidates representing University in State / National / International / Inter University Sports events, Co & Extra - Curricular activities, paper or project presentation with prior permission from the Head of Institution are given exemption upto 10% of the required attendance and such candidates shall be permitted to appear for the current semester examination.

- iii. his / her conduct has been certified to be satisfactory by the concerned Head of Department.
  - iv. Condonation can be allowed only two times during his / her entire course of study.
- 6.2 Candidates who do not complete the semester (as per clause 6.1), will not be permitted to write the end-semester examination and are not permitted to go to next semester. They are required to repeat the incomplete semester in the next academic year.

## 7. PROCEDURES FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

- i. Every teacher is required to maintain a 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the Head of the Departments periodically (atleast three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the Departments will put his signature and date after due verification at the end of the semester, the record should be verified by the Head of the Institution who will keep this document in safe custody (for five years).

### ii. Theory subjects [25 marks]

#### (a). Unit Tests [60% weight] :

Three tests each carrying fifty (50) marks shall be conducted by the Department / Institution. The total marks obtained in all the test put together out of 150, shall be reduced to 60 marks and rounded to nearest integer (this implies equal weight to all the three tests). However a retest at the discretion of the Head of the Department may be conducted for the deserving candidates.

#### (b). Assignment [30% weight] :

Three Assignments requiring work of average 5 to 6 hours of study and written work of average 5 to 6 hours, each carried out by a student in a separate assignment folder, duly indexed with headings, date of submission, marks, remarks and signature of faculty with date etc.

#### (c). Attendance [ 10% weight] :

A maximum 10 marks for attendance out of 100 marks shall be given to each student depending on his/her attendance percentage as per the distribution given below:

| Attendance (10 Marks)    |       |
|--------------------------|-------|
| Percentage of attendance | Marks |
| 75                       | 0     |
| 76 - 80                  | 2     |
| 81 - 84                  | 4     |
| 85 - 89                  | 6     |
| 90 - 94                  | 8     |
| 95 and above             | 10    |

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2009 - 2010 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt + two more attempts), he / she would be declared as a passed candidate in that examination.

iii. **Practical Courses [25 marks]**

Every practical exercise / experiment shall be evaluated based on conduct of exercise / experiment and records maintained. There shall be atleast one test. The criteria for arriving the internal assessment marks are :

|  |              |
|--|--------------|
| Experiment / Record / Average Practical classes performance: | 50% weight   |
| Practical Test   | : 40% weight |
| Attendance   | : 10% weight |
| Total 100 marks should be reduced to 25 marks                |              |

iv. **Theory Subjects with Laboratory Component**

(a). **Unit Tests [60% weight] :**

If there is a theory subject with Laboratory component, there shall be three tests; the first two tests (each 50 Marks) will be from theory portions and third test (maximum marks 50) will be for laboratory component. The total 150 marks should be reduced to 60 marks. However a retest at the discretion of the Head of the Department may be conducted for the deserving candidates.

(b). **Assignment [30% weight] :**

Three Assignments (at least 2 per term) requiring work of average 5 to 6 hours of study and written work of average 5 to 6 hours, each carried out by a student in a separate assignment folder, duly indexed with headings, date of submission, marks, remarks and signature of faculty with date etc.

(c). **Attendance [10% weight] :**

A maximum 10 marks for attendance out of 100 marks shall be given to each student depending on his/her attendance percentage as per the distribution given below:

| Attendance (10) Marks    |       |
|--------------------------|-------|
| Percentage of attendance | Marks |
| 75                       | 0     |
| 76 - 80                  | 2     |
| 81 - 84                  | 4     |
| 85 - 89                  | 6     |
| 90 - 94                  | 8     |
| 95 and above             | 10    |

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2009 - 2010 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt + two more attempts), he / she would be declared as a passed candidate in that examination.

v. **Project Work**

There shall be three assessments during the semester by a review committee. The students shall make presentation on the progress made before the committee. The Head of the Institution shall constitute the review committee for each branch of study. The criteria for arriving the internal assessment marks for the Project Work evaluated for 50 marks are :

|                                    |       |
|------------------------------------|-------|
| Work assessed by the Project Guide | : 50% |
| Work Assessed by a committee       | : 50% |

The Internal marks are valid for two more attempts in addition to the current attempt for the candidates admitted from the academic year 2009 - 2010 and onwards. If a candidate scores 50% of marks only in the end semester examination, after three attempts (First attempt + two more attempts), he / she would be declared as a passed candidate in that examination.

#### 8. PROCEDURE FOR COMPLETING THE PROGRAMME

- i. A candidate who has for some reason discontinued the course can join the course of study of any semester only at the time of its normal commencement in the Institution for regular students upon satisfying all the following conditions
  - a) he / she should have completed the course of study of the previous semesters.
  - b) he / she should be eligible to register for the examinations and satisfy rule 8 (iii)
  - c) he / she should have registered for all the examinations of the previous semesters.
- ii. A candidate will be permitted to proceed from one semester to the next higher semester only if he / she has satisfied the regulation for eligibility to appear for the End-Semester examination in the concerned semester, subject to the condition that the candidate should register for all the arrear subjects of lower semesters along with the current (higher) semester subjects.
- iii. A candidate should have completed the B.E. Degree Programme within a period of SEVEN consecutive academic years (14 semesters) from the date of admission to the course, even if the candidate discontinues and rejoins subsequently, to be eligible for the award of the degree. The minimum and maximum period for completion of the U.G. Programmes are given below:

| Programme        | Min. No. of Semesters | Max. No. of Semesters |
|------------------|-----------------------|-----------------------|
| B.E. (Part Time) | 7                     | 14                    |

#### 9. REQUIREMENTS FOR APPEARING FOR SEMESTER EXAMINATION

A candidate shall normally be permitted to appear for the semester examination of the current semester if he/she has satisfied the semester completion requirements (Subject to Clause 6.1) and has registered for examination in all subjects of that semester. Registration is mandatory for current semester examinations as well as arrears examinations failing which the candidate will not be permitted to move to the higher semester.

#### 10. PASSING MINIMUM AND CLASSIFICATION OF SUCCESSFUL CANDIDATES

- i. For each subject the examination will be conducted for 100 marks. A candidate who secures not less than 50% of the total marks in the End Semester examination and Internal Assessment put together in both theory and Practical courses, including Project work, subject to securing a minimum of 50% in the End - Semester examination,



wherever applicable, shall be declared to have passed the examination in that subject. When the mark secured for 100 is converted to 75, minimum 37 marks must be secured for pass. Any Programme, during any semester, conducts the lab in two parts, say A and B, it is mandatory that the student must appear for both the parts of the lab in the end semester practical examination. The candidate is declared as pass in both the parts A and B lab, only if he / she secures a minimum of **50% put together**, and the student must compulsorily appear for both the parts of the lab in the end semester practical examination. If the candidate is absent for any one part of the lab, the candidate is declared as fail in both the parts A and B of the lab [marked as Absent in External Examinations] and he / she should appear in both, part A and B in the Subsequent semesters.

- ii. A candidate who successfully completes the course requirements and has passed all the prescribed examinations in all the Seven Semesters within a maximum period of Seven years(14 semesters) reckoned from the commencement of the first semester to which the candidate was admitted is eligible to get the degree.
- iii. A candidate who qualifies for the Degree by passing the examination in all subjects of the entire Programme in first attempt within a period of Seven Semesters from the date of admission to the Programme and secures a **CGPA of not less than 8.00** for the entire Programme shall be declared to have passed the examination for the degree in **FIRST CLASS WITH DISTINCTION**. For this purpose the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.
- iv. A candidate transferred from other Institution, who qualifies for the Degree by passing the examination in all subjects of the entire Programme in first attempt within a period of Seven Semesters from the date of admission to the Programme and secures a **CGPA of not less than 8.00** for the entire Programme shall be declared to have passed the examination for the degree in **FIRST CLASS WITH DISTINCTION**. For this purpose the withdrawal from examination will not be construed as an appearance. Further, the authorized break of study will not be counted for the purpose of classification.
- v. A candidate who qualifies for the award of the Degree having passed the examinations in all the subjects of the Programme in the semesters first to seven within a maximum period of Nine consecutive semesters after his/her commencement of study in the first semester and secures a **CGPA of not less than 6.50** for the entire Programme shall be declared to have passed the examination for the degree in **FIRST CLASS**. For this purpose, the authorized break of study will not be counted for the purpose of classification.
- vi. All other successful candidates shall be declared to have passed the examination for the Degree in **SECOND CLASS**.
- vii. A candidate who is absent in semester examination in a subject / project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification.

#### 11. ISSUE OF GRADE SHEETS

Individual grade sheet for each semester will be issued, containing the following information through the Head of the Department concerned, after the publication of the results.

- i) The **credits** obtained in each subject in internal assessment and end semester examination and total **credits** obtained for each course.
- ii) Whether the candidate has passed / failed in the courses concerned.

## 12. MALPRACTICE

If a student indulges in malpractice in any of the end semester examinations, he / she shall be liable for punitive action as and when prescribed by the **Anna University, Chennai**.

## 13. REVALUATION

- i. Copies of answer script for theory subjects can be obtained from the Office of the Controller of Examinations on payment of a prescribed fee specified for this purpose through proper application.
- ii. A candidate can apply for revaluation of his / her semester examination answer paper in a theory subject, on payment of a prescribed fee through proper application to the Office of the Controller of Examinations, as per the norms given by the Chairman, Academic Council. Revaluation is not permitted for Practical subjects and for Project work.
- iii. Retotalling is permissible for all arrear and current theory subjects.
- iv. Challenging the revaluation is permitted for those students who have applied for photocopy of the answer script. The Copy of answer Script is to be valued by a competent authority and the valued script should be submitted to COE's office along with the prescribed fee for challenging revaluation.

## 14. ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be declared to be eligible for the award of the B.E Degree provided the candidate has

- i) Successfully completed the course requirements and has passed all the prescribed examinations in all the **7 semesters within a maximum period of 7 years** from the commencement of first semester to which the candidate was admitted.
- ii) The award of degree must have been approved by the Syndicate of the University.
- iii) The Minimum credit to be earned to get -PTBE degree is 90 .

## 15. CLASS COMMITTEE

15.1 A class committee consists of teachers of the concerned class, student representatives and a chairperson who is not teaching the class. It is like the 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching-learning process. The functions of the class committee include

- Solving problems experienced by students in the class room and in the laboratories.
- Clarifying the regulations of the degree programme and the details of rules therein.
- Informing the student representatives the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
- Informing the student representatives the details of Regulations regarding weightage used for each assessment. In the case of practical courses (laboratory/drawing/ project work/ seminar etc.) the breakup of marks for each experiment / exercise/ module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the weak students, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students.

- 15.2 The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in each class of the first semester (generally common to all branches), the class committee is to be constituted by the Head of the Institution.
- 15.3 The class committee shall be constituted on the first working day of any semester or earlier.
- 15.4 Atleast 4 student representatives (usually 2 boys and 2 girls) shall be included in the class committee.
- 15.5 The chairperson of the class committee may invite the Faculty Adviser(s) and the Head of the Department to the meeting of the class committee.
- 15.6 The Head of the Institution may participate in any class committee of the institution.
- 15.7 The chairperson is required to prepare the minutes of every meeting, submit the same to the Head of the Institution within two days of the meeting and arrange to circulate among the concerned students and teachers. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the management by the Head of the Institution.
- 15.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weight of assessments within the framework of the Regulations. Two or three subsequent meetings may be held at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express the opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

#### **16. FACULTY ADVISER**

To help the students in planning their courses of study and for general advise on the academic programme, the Head of the Department of the student will attach a certain number of students to a teacher of the Department who shall function as Faculty Adviser for those students throughout their period of study. Such Faculty Adviser shall advise the students and monitor the courses taken by the students, check the attendance and progress of the students attached to him / her and counsel them periodically. If necessary, the faculty adviser may also discuss with or inform the parents about the progress of the students.

#### **17. COURSE COMMITTEE FOR COMMON SUBJECTS**

Each common theory subjects offered to more than one discipline or group, shall have a "Course Committee" comprising all the teachers teaching the common subject with one of them nominated as Course Coordinator. The nomination of the course Coordinator shall be made by the Head of the Department / Head of the institution depending upon whether all the teachers teaching the common subject belong to a single department or to several departments. The 'Course committee' shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Where it is feasible, the course committee may also prepare a common question paper for the test(s).

**18. PROVISION FOR WITHDRAWAL FROM EXAMINATION**

- i. A candidate may, for valid reasons, be granted permission to withdraw from appearing for the examination in any subject or subjects of only one semester examination during the entire duration of the degree programme. Also only one application for withdrawal is permitted for that semester examination in which withdrawal is sought.
- ii. Withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination and if it is made prior to the commencement of the last examination in that semester and duly recommended by the Head of the Department and approved by the Head of the Institution.
- iii. Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.
- iv. Withdrawal is possible only if the candidate satisfies the attendance requirements [as per Clause 6.1]

**19. TEMPORARY BREAK OF STUDY FROM A PROGRAMME**

- i. A candidate is not normally permitted to temporarily break the study. However if a candidate intends to temporarily discontinue the programme in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the programme in a later semester he/she shall apply to the Head of the Institution in advance, in any case, not later than the last date for registering for the semester examinations of the semester in question, through the Head of the Department stating the reasons thereof.
- ii. The candidate permitted to rejoin the programme after the break shall be governed by the rules and regulations in force at the time of rejoining.
- iii. The duration specified for passing all the subjects for the purpose of classification vide Clause 10(iii), 10(iv) and 10(v) shall be increased by the period of such permitted break of study.
- iv. The total period for completion of the programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 8(iii) irrespective of the period of break of study in order that he/she may be eligible for the award of the degree (vide clause 14).
- v. If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' and Clause 19(iii) is not applicable for this case.

**20. RANK OF A STUDENT**

A candidate who qualifies for the Degree by passing the examination in all subjects of the entire Programme in first attempt within a period of Seven Semesters from the date of admission to the Programme can be given his position in the class as rank. The Rank is determined from I Semester to VII Semester end semester examination CGPA. Students transferred from other institutions to GCT are not eligible for rank.

**21. PROCEDURE FOR USING SCRIBER**

If a candidate is physically handicapped (in case of accidents / ill health) at the time of examination, then he / she may be permitted to use a scribe to write the examination. In such case 30 minutes extra time will be permitted. The Scribe shall be a non-engineering student / graduate.

**22. DISCIPLINE**

Every student is required to observe disciplined and decorous behaviour both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the College. In the event an act of indiscipline being reported, the Principal shall constitute a disciplinary committee consisting of three Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline. The disciplinary action is subject to review by the University in case the student represents to the University. Any expulsion of the student from the college shall be with prior concurrence from Director of Technical Education / University.

**23. CREDIT SYSTEM**

The letter grade and the grade point are awarded based on percentage of marks secured by a candidate in individual course as detailed below:

| Range of Total Marks | Letter Grade | Grade Points (GP) |
|----------------------|--------------|-------------------|
| 90 to 100            | S            | 10                |
| 80 to 89             | A            | 9                 |
| 70 to 79             | B            | 8                 |
| 60 to 69             | C            | 7                 |
| 55 to 59             | D            | 6                 |
| 50 to 54             | E            | 5                 |
| 0 to 49              | U            | 0                 |
| Incomplete           | I            | 0                 |
| Withdrawal           | W            | 0                 |

"U" denotes failure in the subject.

"I" denotes incomplete as per clause 6.1 and hence prevention from writing End Semester Examination.

"W" denotes withdrawal from the subject.

After results are declared, Grade sheets will be issued to each student which will contain the following details :

The list of subjects enrolled during the semester and the grades scored.  
The Grade Point Average (GPA) for the semester and  
The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of subjects registered and the points corresponding to the grades scored in those subjects, taken for all the subjects, to the sum of the number of credits of all the subjects in the semester.

$$\text{GPA} = \frac{\text{Sum of } [C \times \text{GP}]}{\text{Sum of } C}$$

where C - credit of a particular subject  
GP - grade point obtained by the student in the respective subject.

CGPA will be calculated in a similar manner, considering all the subjects enrolled from first semester. "U", "I" and "W" grades will be excluded for calculating GPA and CGPA.

Each subject is normally assigned certain number of credits with 1 credit per lecture period per week, 1 credit per tutorial period per week, 1 credit for 2 periods of laboratory or practical or seminar or project work per week (2 credits for 3 or 4 periods of practical).

However, the performance of a student is evaluated only based on the credit system.

#### **24. REVISION OF REGULATION AND CURRICULUM**

The college may from time to time revise, amend or change the regulations, scheme of examinations and syllabus, if found necessary.

# Curriculum



**CURRICULUM**  
(Part Time Candidates admitted during 2012-2013 and onwards)

**FIRST SEMESTER**

| S. No. | Subject Code | Course title                | Session marks | Final Exam marks | Total marks | L | T | P | C         |
|--------|--------------|-----------------------------|---------------|------------------|-------------|---|---|---|-----------|
|        |              | <b>THEORY</b>               |               |                  |             |   |   |   |           |
| 1      | 12C1Z2       | Engineering Mathematics - I | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 2      | 12C105       | Engineering Mechanics       | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 3      | 12C1Z6       | Programming in C            | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 4      | 12C304       | Mechanics of Fluids         | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 5      | 12C206       | Engineering Geology         | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
|        |              | <b>TOTAL</b>                |               |                  | <b>500</b>  |   |   |   | <b>18</b> |

**SECOND SEMESTER**

| S. No. | Subject Code | Course title                          | Session marks | Final Exam marks | Total marks | L | T | P | C         |
|--------|--------------|---------------------------------------|---------------|------------------|-------------|---|---|---|-----------|
|        |              | <b>THEORY</b>                         |               |                  |             |   |   |   |           |
| 1      | 12C2Z2       | Engineering Mathematics - II          | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 2      | 12C303       | Mechanics of Solids- I                | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 3      | 12C306       | Water supply Engineering              | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 4      | 12C403       | Applied Hydraulics and Fluid Machines | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 5      | 12C405       | Surveying - II                        | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
|        |              | <b>TOTAL</b>                          |               |                  | <b>500</b>  |   |   |   | <b>18</b> |



### THIRD SEMESTER

| S. No. | Subject Code | Course title  | Session marks | Final Exam marks | Total marks | L | T | P | C         |
|--------|--------------|---|---------------|------------------|-------------|---|---|---|-----------|
|        |              | <b>THEORY</b>   |               |                  |             |   |   |   |           |
| 1      | 12C401       | Numerical Methods                                     | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 2      | 12C402       | Mechanics of Solids - II                              | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 3      | 12C406       | Waste Water Engineering                               | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 4      | 12C502       | Basic Structural Design-I (Masonry, Timber and Steel) | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 5      | 12C505       | Mechanics of Soils                                    | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
|        |              | <b>TOTAL</b>  |               |                  | <b>500</b>  |   |   |   | <b>19</b> |

### FOURTH SEMESTER

| S. No. | Subject Code | Course title                            | Session marks | Final Exam marks | Total marks | L | T | P | C         |
|--------|--------------|---|---------------|------------------|-------------|---|---|---|-----------|
|        |              | <b>THEORY</b>                           |               |                  |             |   |   |   |           |
| 1      | 12C501       | Structural Analysis -I                  | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 2      | 12C602       | Basic Structural Design - II (Concrete) | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 3      | 12C503       | Water Resources Engineering             | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 4      | 12C302       | Environmental Science and Engineering   | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 5      | 12C604       | Foundation Engineering                  | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
|        |              | <b>TOTAL</b>                            |               |                  | <b>500</b>  |   |   |   | <b>17</b> |

### FIFTH SEMESTER

| S. No. | Subject Code | Course title           | Session marks | Final Exam marks | Total marks | L | T | P | C         |
|--------|--------------|------------------------|---------------|------------------|-------------|---|---|---|-----------|
|        |              | <b>THEORY</b>          |               |                  |             |   |   |   |           |
| 1      | 12C601       | Structural Analysis II | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 2      | 12C506       | Highway Engineering    | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 3      | 12C702       | Steel Structures       | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 4      | 12C504       | Concrete Technology    | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 5      |              | Elective I             | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
|        |              | <b>TOTAL</b>           |               |                  | <b>500</b>  |   |   |   | <b>17</b> |

### SIXTH SEMESTER

| S. No. | Subject Code | Course title  | Session marks | Final Exam marks | Total marks | L | T | P | C         |
|--------|--------------|---|---------------|------------------|-------------|---|---|---|-----------|
|        |              | <b>THEORY</b>   |               |                  |             |   |   |   |           |
| 1      | 12C703       | Concrete Structures   | 25            | 75               | 100         | 3 | 1 | 0 | 4         |
| 2      | 12C605       | Design and Drawing - I (Irrigation and Environmental Engineering) | 25            | 75               | 100         | 2 | 0 | 3 | 4         |
| 3      |              | Elective II   | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
| 4      |              | Elective III  | 25            | 75               | 100         | 3 | 0 | 0 | 3         |
|        |              | <b>PRACTICAL</b>  |               |                  |             |   |   |   |           |
| 5      | 12C708       | Computer Application Laboratory                                   | 25            | 75               | 100         | 0 | 0 | 3 | 2         |
|        |              | <b>TOTAL</b>  |               |                  | <b>500</b>  |   |   |   | <b>16</b> |

## SEVENTH SEMESTER

| Sl. No. | Subject Code | Course Title                                | Sessional Marks | Final Exam marks | Total Marks | L  | T | P | C         |
|---------|--------------|---|-----------------|------------------|-------------|----|---|---|-----------|
|         |              | <b>THEORY</b>                               |                 |                  |             |    |   |   |           |
| 1       | 12C701       | Prestressed Concrete Structures             | 25              | 75               | 100         | 3  | 1 | 0 | 4         |
| 2       | 12C7 04      | Design and Drawing – II (Concrete and Steel | 25              | 75               | 100         | 2  | 0 | 3 | 4         |
| 3       |              | Elective IV                                 | 25              | 75               | 100         | 3  | 0 | 0 | 3         |
| 4       |              | Elective V                                  | 25              | 75               | 100         | 3  | 0 | 0 | 3         |
|         |              | <b>PRACTICAL</b>                            |                 |                  |             |    |   |   |           |
| 5       | 12C801       | PROJECT WORK AND VIVA –VOCE                 | 50              | 150              | 200         | 12 | 0 | 0 | 6         |
|         |              | <b>TOTAL</b>                                |                 |                  | <b>600</b>  |    |   |   | <b>20</b> |

**LIST OF ELECTIVE SUBJECTS  
BRANCH- CIVIL ENGINEERING  
(FIFTH SEMESTER)**

| S. No. | Subject Code | Course title                                 | Session marks | Final Exam marks | Total marks | L | T | P | C |
|--------|--------------|--|---------------|------------------|-------------|---|---|---|---|
| 1      | 12C6E0       | Construction Management                      | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 2      | 12C6E1       | Railway Engineering                          | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 3      | 12C6E2       | Smart Materials and Smart Structures         | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 4      | 12C6E3       | Maintenance and Rehabilitation of Structures | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 5      | 12C6E4       | Safety in Civil Engineering Practices        | 25            | 75               | 100         | 3 | 0 | 0 | 3 |

**LIST OF ELECTIVE SUBJECTS  
BRANCH- CIVIL ENGINEERING  
(SIXTH SEMESTER)**

| S. No. | Subject Code | Course title   | Session marks | Final Exam marks | Total marks | L | T | P | C |
|--------|--------------|--|---------------|------------------|-------------|---|---|---|---|
| 1      | 12C7E0       | Finite Element Method                                | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 2      | 12C7E1       | Advanced Concrete Design                             | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 3      | 12C7E2       | Basics of Dynamics and Aseismic design of structures | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 4      | 12C7E3       | Pavement Engineering                                 | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 5      | 12C7E4       | Town Planning and Architecture                       | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 6      | 12C7E5       | Industrial Waste Water Management                    | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 7      | 12C7E6       | Operation Research                                   | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 8      | 12C7E7       | Professional Ethics                                  | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 9      | 12C7E8       | Airport, Docks and Harbor Engineering                | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 10     | 12C7E9       | Hydrology  | 25            | 75               | 100         | 3 | 0 | 0 | 3 |

**LIST OF ELECTIVE SUBJECTS  
BRANCH- CIVIL ENGINEERING  
(SEVENTH SEMESTER)**

| S. No. | Subject Code | Course title  | Session marks | Final Exam marks | Total marks | L | T | P | C |
|--------|--------------|---|---------------|------------------|-------------|---|---|---|---|
| 1      | 12C8E0       | Experimental Stress Analysis                        | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 2      | 12C8E1       | Fundamentals of Remote Sensing and GIS Applications | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 3      | 12C8E2       | Non - Conventional Energy Sources                   | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 4      | 12C8E3       | Machine Foundation                                  | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 5      | 12C8E4       | Geotechnical Earthquake Engineering                 | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 6      | 12C8E5       | Bridge Engineering                                  | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 7      | 12C8E6       | Environmental Management                            | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 8      | 12C8E7       | Traffic Engineering and Management                  | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 9      | 12C8E8       | Ground Improvement Techniques                       | 25            | 75               | 100         | 3 | 0 | 0 | 3 |
| 10     | 12C8E9       | Prefabricated Structures                            | 25            | 75               | 100         | 3 | 0 | 0 | 3 |

# Syllabi



12C1Z2 ENGINEERING MATHEMATICS – I

L T P C  
3 1 0 4

UNIT-I MATRICES

(09)

Characteristic equation – Eigen values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem(statement only) and applications- Diagonalisation by similarity transformation - Reduction of quadratic form to canonical form.

UNIT-II HYPERBOLIC FUNCTIONS AND SOLID GEOMETRY

(09)

Hyperbolic functions and Inverse Hyperbolic functions -Identities-Real and imaginary parts- solving problems using hyperbolic functions.

Sphere – tangent plane – Orthogonal spheres - Cone- right circular cone – Cylinder – right circular cylinder.

UNIT-III APPLICATIONS OF DIFFERENTIAL CALCULUS

(09)

Curvature - cartesian and polar coordinates – centre and radius of curvature - circle of curvature -Evolutes - Envelopes - Evolutes as envelope of normal.

UNIT-IV FUNCTION OF SEVERAL VARIABLES

(09)

Function of two variables - Taylor's theorem (statement only) and expansions - maxima and minima - constrained maxima and minima by Lagrangian multiplier method - Jacobians - differentiation under integral sign.

UNIT-V INTEGRAL CALCULUS

(09)

Gamma and Beta functions - Double integration - Cartesian and Polar Coordinates – change of order of integration - Area as double integral – Triple integration –Volume as a triple integral - Transformation to Cylindrical and Spherical co-ordinates.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

**Text Books**

1. Veerarajan.T., "Engineering Mathematics" for Semesters I and II, Tata McGraw Hill Publishing Co., New Delhi, 2010.
2. Dr.Kandasamy.P., Dr.Thilagavathy.K and Dr.Gunavathy.K., "Engineering Mathematics" for First Year B.E/B.Tech, S. Chand & Co., Ram Nagar, New Delhi, 2010.

**Reference Books**

1. N.P.Bali., Dr. Manish Goyal., "A text book of Engineering Mathematics" vol. I, University science Press, New Delhi, 2010.
2. H.C.Taneja., "Advanced Engineering Mathematics" vol. I, I.K.International Pub.House Pvt.Ltd., New Delhi, 2007.
3. Baburam., "Engineering Mathematics" vol. I, Pearson, New Delhi, 2010.
4. B.V.Ramana., "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co., New Delhi 2007.
5. Grewal B.S., "Higher Engineering Mathematics" (40<sup>th</sup> Edition) Khanna Publishers, New Delhi.,2007

**12C105 ENGINEERING MECHANICS**  
(Common to Mech/Prod)

L T P C  
3 1 0 4

**UNIT-I INTRODUCTION TO MECHANICS AND FORCE CONCEPTS**

(10)

Definition of mechanics – characteristics – system of forces – parallelogram, triangle and polygon law of forces – resultant of a force system – resultant of a concurrent, coplanar and parallel force system – resolution and composition of forces – Lami's theorem – moment of a force – physical significance of moment-Varignon's theorem – resolution of a force into force and couple – forces in space – addition of concurrent forces in space – equilibrium of a particle in space.

**UNIT-II FRICTION**

(08)

Frictional resistance – classification of friction- laws of friction – coefficient of friction-angle of friction – angle of repose – cone of friction – free body diagram-advantages-equilibrium of a body on a rough horizontal and inclined plane – ladder friction – rope friction – wedge friction. Simple machines-concept of lifting machines-law of lifting machine – efficiency- mechanical advantages – velocity ratio and their relationship.

**UNIT-III GEOMETRICAL PROPERTIES OF SECTION**

(08)

Introduction – concept of first moment – definition of centroid – centroid of an area – centroid of simple figures – composite sections – bodies with cutparts-moment of inertia – theorem of moment of inertia – moment of inertia of composite sections – principal moment of inertia of plane areas- radius of gyration.

**UNIT-IV BASICS OF DYNAMICS**

(10)

Definition – kinematics and kinetics – displacements, velocity and acceleration- Equations of motion -Types of motion – Rectilinear motion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves – motion under gravity – relative motion – curvilinear motion of a particle – projectiles – angle of projection – range – time of flight and maximum height.

Newton's second law of motion – linear momentum – D'Alembert's principle, Dynamic equilibrium - work energy equation of particles- law of conservation of energy – principle of work and energy.

**UNIT-V IMPULSE MOMENTUM AND IMPACT OF ELASTIC BODIES**

(09)

Impulsive force – Impulse – linear impulse and momentum – Equations of momentum – principle impulse and momentum – impulsive motion – conservation of momentum.

Definition – Time of compression, restitution, collision – law of conservation of momentum – Co-efficient of restitution – types of impact – collision of elastic bodies by direct central impact and oblique impact – collision of small body with a massive body – loss of kinetic energy.

LECTURE:45 TUTORIAL:15 TOTAL:60 hrs



**Text Books**

1. S.S. Bhavikatti and K.G. Rajasekarappa, *Engineering Mechanics*, New Age International (P) Ltd. 1999.
2. S.C. Natesan, *Engineering Mechanics*, Umesh Publications, Delhi, 2002.

**Reference Books**

1. F.B. Beer and E.R. Johnson, *Mechanics for Engineers*, Tata Mc.Graw Hill publishing Ltd, 1996.
2. S. Timoshenko and Young, *Engineering Mechanics*, Mc.Graw Hill, 4<sup>th</sup> Edition, 1995.
3. Irving shames, *Engineering Mechanics*, Prentice Hall of India Ltd, Delhi, 1980.
4. Domkundwar V.M and Anand V. Domkundwar, *Engineering Mechanics (Statics and Dynamics)*, Dhanpat Rai & Co. Ltd, 1<sup>st</sup> Edition, 2006.
5. Suhas Nitsure, *Engineering Mechanics*, Technical Publications, Pune, 1<sup>st</sup> edition, 2006.

## 12C1Z6 PROGRAMMING IN C

[Common to all branches]

L T P C

3 0 0 3

### UNIT I BASICS OF COMPUTER, PROGRAMMING AND INFORMATION TECHNOLOGY (09)

Digital Computer Fundamentals- Block diagram of a computer-Components of a Computer system-Applications of Computers-Hardware and Software definitions-Categories of Software-Booting-Installing and Uninstalling Software-Software privacy-Software terminologies-Information Technology Basics-History of Internet-Internet Tools. Problem solving Techniques-Program-Program development cycle-Algorithm-Flow Chart-Pseudo Code-Program control structures-Types and generation of programming languages-Development of algorithms for simple problems.

### UNIT II BASIC ELEMENTS OF C (09)

Introduction to C-C Declaration- Operators and Expressions-Input and output Functions- Decision statements: If-If else- Nested If else-If else If ladder-break-continue-goto-switch-nested switch case-Switch case and nested ifs-Loop control: for, nested for, while, do-while- do while statement with while loop-Arrays: initialization, characteristics, types and operations.

### UNIT III POINTERS AND FUNCTIONS (09)

Strings and Standard functions: Declaration and initialization, formats, standard, conversion and memory functions, applications; Pointers-pointers and address- declaration-void, wild, constant pointers -arithmetic operations with pointers- pointers and arrays- pointers to pointers-pointers to pointers- pointers and strings; Functions-return statement-types-call by value and reference-returning more values, function as an argument, function with operators, decision statements, loop statements, arrays and pointers, recursion-Tower of Hanoi.

### UNIT IV STORAGE CLASSES, STRUCTURE AND UNION (09)

Storage classes: auto-extern-static-register; Preprocessor directives; Structures: Declaration and initialization, structure within structure-Array of Structures-pointer to structure-structure and functions-typedef-bit fields- enumerated data types; union: calling BIOS and DOS services-union of structures.

### UNIT V FILES, GRAPHICS AND DYNAMIC MEMORY ALLOCATION (09)

Files: streams and file types-operations-File I/O-read and write-other -creating, processing and updating files-simple file handling programs-low level programming-command line arguments- Environment variables; Graphics: initialization-functions-library functions-text-patterns and styles-mouse programming-drawing non common figures; Dynamic memory allocation.

LECTURE: 45 TOTAL: 45

**Text Books**

1. ITL Education Solutions Limited, "**Introduction to Information Technology**", Pearson Education (India), 2005. (Unit I) (Chapters: 1, 7, 9, 10, 15, 16)
2. Ashok N. Kamthane, "**Programming in C**", Pearson Education, Second edition, 2012.

**Reference Books**

1. Byron Gottfried, "**Programming with C**", II Edition, (Indian Adapted Edition), TMH publications, 2006.
2. Brain W.kernighan and Dennis M.Ritchie, "**The C programming language**", Pearson Education Inc.(2005).
3. E. Balagurusamy, "**Programming in ANSI C**", 5E, Tata McGraw-Hill Education, 2011.

12C304 MECHANICS OF FLUIDS

L T P C

3 1 0 4

UNIT - I BASIC CONCEPTS AND FLUID STATICS

(10)

Dimensions and Units - Fluid properties - Density, Specific gravity, viscosity, surface tension, capillarity and elasticity, compressibility, vapour pressure - Continuum Concept - Control Volume Fluid statics - Pascal's Law - pressure measurement - piezometer and manometers. - Hydrostatic forces on plane and curved surfaces - Stability of Floating Bodies - Buoyancy - metacentre and metacentric height - simple problems.

UNIT II - PRINCIPLES OF MASS

(08)

Basic principles of fluid flow - Types of flow - types flow line - continuity equation - one dimensional and three dimensional - velocity potential and stream function - Free and Forced vortex flow.

UNIT-III - PRINCIPLE OF ENERGY

(08)

Energy and its forms. Energy equation - Euler's and Bernoulli's equation - Applications venturimeter - orifice meter - pitot tube - Flow over notches and weirs - Other Flow measuring devices

UNIT IV - FLOW THROUGH CONDUITS

(09)

Laminar flow through circular pipes and between parallel plates - Hagen Poiseuille equation - turbulent flow - Darcy Weisbach formula - Moody diagram - Impulse Momentum principle.

UNIT V - BOUNDARY LAYER AND FLOW AROUND IMMERSED BODIES

(10)

Boundary layer - Definition - Boundary layer on a flat plate - Thickness and classification - Displacement, energy and momentum thickness - Boundary layer separation and control - Flow around submerged objects - Drag and lift coefficients - Lift on cylinders - Streamlined and bluff bodies.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

Text Books

1. R.K. Rajput, "A text book of Fluid Mechanics", S.Chand and Company, New Delhi, 2007.
2. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics", Including Hydraulic Machines, Standard Book House, New Delhi, 2002.
3. S.Ramamurtham and R.Narayanan, "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat rai Publishing Co (P) Ltd, New Delhi, 2000.

Reference Books

1. Streeter, Victor L., Wylie, E.Benjamin, "Fluid Mechanics", McGraw - Hill, 1998.
2. Kumar.K.L., "Engineering Fluid Mechanics", Eurasia Publishing Houses (P) Ltd., New Delhi 2000.
3. Natarajan M.K, "Principles of Fluid Mechanics", Anuradha Agencies, Vidyal Karuppur, Kumbakonam, 1995.

12C206 ENGINEERING GEOLOGY

L T P C

3 0 0 3

UNIT-I GENERAL GEOLOGY

(10)

Interrelationship between Geology and civil engineering – Branches of Geology – Earth Structure and composition – Geological processes – Weathering – work of rivers, sea, wind and their Engineering significance- Earthquakes –Earthquake Zones in India - Volcanoes – Ground water – Origin, Occurrence, Properties of rock – Geological work of ground water – Importance in Civil Engineering.

UNIT-II MINERALOGY

(09)

Elementary knowledge on symmetry elements of important Crystallographic systems – Physical properties of minerals – Study of the following rock forming minerals – Quartz family, Felspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet. Ore minerals - Haematite, Magnetite, Bauxite, Graphite, Magnesite – Clay minerals – Properties and Engineering significance.

UNIT-III PETROLOGY

(09)

Formation and Classification of rocks and their distinctive properties – Description, Occurrence, Engineering properties and Distribution of the following rocks – Igneous rocks – Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt. Sedimentary rocks- Sandstone, Limestone, shale, Conglomerate, and Breccia – Metamorphic rocks – Quartzite, Marble, Slate, phyllite, Gneiss and schist.

UNIT-IV STRUCTURAL GEOLOGY

(08)

Attitude of beds Dip and Strike - Uses of Clinometer compass – Outcrops – Geological maps – their uses – Structural features – Folds, Faults, Unconformities and Joints – their significance on engineering constructions.

UNIT-V INTRODUCTION TO GEOLOGICAL INVESTIGATIONS

(09)

Geophysical investigations – Seismic and electrical resistivity methods – Aerial Photo and satellite imageries-Interpretation of remote sensing data-Exploration for ground water – Geological investigations pertaining to Dam and Reservoir, Tunnels and Road cuttings – Landslides – causes and prevention – Sea erosion and coastal protection.

LECTURE: 45 TOTAL:45hrs

**Text Books**

1. Parbin Singh, *Engineering and General Geology*, Katson Publication House. 2004
2. Bangar.K.M, *Principles of Engineering Geology*, Standard Publishers & Distributors, 1705- B, Naisarak, Delhi-1995.

**Reference Books**

1. Legget, "Geology and Engineering", McGraw Hill Book company, 1998 Blyth, "Geology for Engineers", ELBS 1995.

12C2Z2 ENGINEERING MATHEMATICS – II

L T P C

3 1 0 4

UNIT I: VECTOR CALCULUS

(9)

Gradient, Divergence, Curl – Directional derivative – Irrotational and Solenoidal fields – Vector identities – Line, Surface and Volume Integrals – Green's Theorem in a Plane, Gauss Divergence and Stoke's Theorems (Statements only) – Verifications and Applications.

UNIT II: ORDINARY DIFFERENTIAL EQUATIONS

(9)

Linear equations of Second and Higher order with constant coefficients – Simultaneous first order Linear equations with constant coefficients – Linear equations of Second and Higher order with variable coefficients – Legendre type Method of variation of parameters – method of reduction of order.

UNIT III: COMPLEX DIFFERENTIATION

(9)

Functions of a Complex variable – Analytic functions – Cauchy Riemann equations and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic functions – Construction of analytic functions – Conformal mappings :  $w = z + a$ ,  $az$ ,  $1/z$ ,  $z^2$ ,  $e^z$ ,  $\cos z$ ,  $\sin z$  and Bilinear Transformation.

UNIT IV : COMPLEX INTEGRATION

(9)

Cauchy's integral theorem, Cauchy's integral formula – Taylor's and Laurent's theorems (Statements only) and expansions – Poles and Residues – Cauchy's Residue theorem – Contour integration – Circular and semicircular contours.

UNIT V: LAPLACE TRANSFORMATIONS

(9)

Laplace transforms – Properties and standard transforms – Transforms of unit step, unit impulse and error functions – Transforms of periodic functions – Inverse Laplace transforms – Initial and Final value theorems – Convolution theorem (statement only) and applications – Applications to Solution of Linear differential equations of second order with constant coefficients.

LECTURE: 45 TUTORIAL: 15 TOTAL HRS: 60

Text Books

1. Veerarajan.T., "Engineering Mathematics" for Semesters I and II, Tata McGraw Hill Publishing Co., New Delhi, 2010.
2. Dr.Kandasamy.P., Dr.Thilagavathy.K and Dr.Gunavathy.K., "Engineering Mathematics" for First Year B.E/B.Tech, S. Chand & Co., Ram Nagar, New Delhi, 2010.

**Reference Books**

1. N.P.Bali., Dr. Manish Goyal., "A text book of Engineering Mathematics" vol. II , University science Press, New Delhi, 2010.
2. H.C.Taneja., "Advanced Engineering Mathematics" vol.II, I.K.International Pub. House Pvt.Ltd., New Delhi, 2007.
3. Baburam., "Engineering Mathematics", Pearson, New Delhi, 2010.
4. B.V.Ramana., "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co., New Delhi, 2007.
5. Grewal B.S., "Higher Engineering Mathematics"(40<sup>th</sup> Edition ) Khanna Publishers, New Delhi., 2007.

12C303 MECHANICS OF SOLIDS – I

L T P C

3 1 0 4

**UNIT I - STRESS AND STRAIN**

(09)

Stress and Strain at a point – Tension, Compression, Shear Stresses – Hooke's law – Relationship among Elastic constants – Stress Strain Diagram for Mild Steel, TOR Steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses – Thin Cylinders – Strain Energy due to Axial Force – Resilience – Stresses due to Impact and Suddenly Applied Load – Compound Bars.

**UNIT II - SHEAR FORCE AND BENDING MOMENT DIAGRAMS**

(09)

Beams and Bending – Types of loads, supports – Shear Force and Bending Moment Diagrams for Cantilever, Simply Supported and Overhanging Beams with Concentrated, Uniformly Distributed and Uniformly Varying Loads – Relationship between Rate of Loading, Shear Force, Bending Moment – Point of Contra Flexure.

**UNIT III - SHEAR AND BENDING STRESSES**

(09)

Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a Cross Section due to Bending Moment and Shear Force for Cantilever, Simply Supported and Overhanging Beams with different loading conditions – Flitched Beams – Combined Direct and Bending Stresses – Condition for No Tension in a section – Strain Energy due to Flexure, Transverse Shear – Shear Stress Distribution

**UNIT IV - TORSION**

(09)

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – Stepped Composite Shafts – Combined Bending Moment and Torsion on Shafts – Strain Energy due to Torsion – Modulus of Rupture – Power Transmitted to a Shaft – Shafts in Series and Parallel – Closed and Open Coiled helical Springs – Leaf Springs – Springs in Series and Parallel – Design of Buffer Springs.

**UNIT V - COMPLEX STRESSES**

(09)

2 D State of Stress – 2D Normal and Shear Stresses on any plane – 2D Strain – Principal Stresses and Principal Planes – Principal Strains and Direction – Graphical Method.

**PLANE TRUSSES:** Analysis of Plane Trusses – Method of Joints – Method of Sections.

LECTURE : 45 TUTORIAL : 15 TOTAL: 60 hrs

**Text Books**

1. Sadhu Singh, "Strength of Materials", Khanna publishers, New Delhi, 2000
2. Vaidyanathan.R, Perumal.P and Lingewari.S, "Mechanics of Solids and Structures" Volume I, Scitech Publications Pvt Ltd, Chennai, 2006.
3. Rajput.R.K, "Strength of Materials", S. Chand & Co., New Delhi, 2007.



**Reference Books**

1. Prasad I.B, "Strength of Materials", Khanna Publishers, New Delhi, 1998.
2. James .M. Gere "Mechanics of Materials", Thomson India, Brooks/Cole, 2006.
3. Robert L.Mott, "Applied Strength of Materials", PHI Learning Pvt Ltd., " New Delhi, 2009
4. Timoshenko.S.B and Gere.J.M, "Mechanics of Materials", Van Nos Reinbhold, New Delhi 1995.
5. Jhunarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol. I, Charotar Publishing House, New Delhi, 1997.
6. Kazimi, "Solid Mechanics", Tata McGraw Hill, New Delhi, 1998.
7. Punmia B C, Jain Ashok and Jain Arun. "Strength of Materials and Theory of structures" – Vol. I, Laxmi Publications Pvt. Ltd., New Delhi, 2000
8. Bansal R K "Strength of Materials', Laxmi Publications, New Delhi, 2007.

12C306 WATER SUPPLY ENGINEERING

L T P C  
3 0 0 3

**UNIT I - PUBLIC WATER SUPPLY SCHEMES AND QUANTITY OF WATER**

(09)

Necessity and objectives of public water supply schemes – planning and financing – treatment of water. Quantity of water – water requirements – continuous and intermittent supply – rate of demand – variations in rate of demand – effect on design – design periods and capacities of different components – population growth and forecast – estimating the quantity of water required.

**UNIT II - HYDROLOGICAL CONCEPTS AND SOURCES OF WATER**

(09)

Hydrological concepts – hydrological cycle – precipitation – types of precipitation – rain fall measurements – rain fall indices – estimation of surface runoff. Sources of water – Types of sources – lakes, ponds, rivers – infiltration galleries – storage reservoirs – storage capacity by analytical and mass curve methods – dam height and cost – types of wells – tests for yield of a well – sanitary protection of wells.

**UNIT III - QUALITY OF WATER AND TRANSPORTATION OF WATER**

(09)

Quality of water – portable water, pure water, mineral water, etc. – Impurities in water – sampling – analysis of water – water borne diseases – quality standards of water. Transportation of water – types of conduits – Hydraulics of pipe flow – design – materials of pressure pipes – pipe corrosion – Theories, effect and prevention – Laying and testing of pipe lines. Pumps – Types of pumps – selection of pumps – pumping stations.

**UNIT IV - PURIFICATION OF WATER**

(09)

Treatment of water – working principles, Purpose and Design of all the unit process of water treatment – Screening – plain Sedimentation – coagulation Sedimentation – filtration – Disinfection – Water softening – Removal of colour, Odour and Tastes – Removal of Iron and manganese – Fluoridation and Defluoridation.

**UNIT V - DISTRIBUTION OF WATER AND IMPACT OF WATER SUPPLY SCHEMES**

(09)

Intakes – types – intake tower – Distribution of water – requirements of good distribution system – method of distribution system – layouts of distribution system – pressure in the distribution system – Pipes in series and pipes in parallel – Equivalent pipe method – Distribution Reservoirs – purpose – types – locations and height – design aspects – preventive methods to reduce wastage of water. Impact of water supply schemes.

LECTURE: 45 TOTAL: 45hrs

**Text Books**

1. Garg. S. K., "Water Supply Engineering", Khannah Publishers, Delhi, September 2001.
2. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India 2008.

**Reference Books**

1. Birdie.G.S., "Water Supply and Sanitary Engineering", Dhanpat Rai and sons, 1985.
2. Fair. G. M., Geyer. J. C., "Water Supply and Waste Water disposal", John Wiley & Sons, 1954.
3. Babbitt. H. E., and Donald. J. J., "Water Supply Engineering", McGraw Hill book Co, 1984
4. Steel E. W. et.al, "Water Supply Engineering", McGraw Hill International Book Co, 1984
5. Duggal. K.N., " Elements of public Health Engineering", S.Chand and Co, 1985. Jain Publishers, CPHEECO MANUAL.

**12C403 APPLIED HYDRAULICS AND FLUID MACHINES**

**L T P C**

**3 1 0 4**

**UNIT I – OPEN CHANNEL FLOW**

**(10)**

Uniform flow – Velocity measurement – Manning's and Chezy's formula – Roughness coefficients – Normal depth and velocity – Most economical sections – Wide open channel – Specific energy – Critical flow and its computation – Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Hydraulic jump – Types – Energy dissipation

**UNIT-II-DIMENSIONAL ANALYSIS**

**(06)**

Dimensional Homogeneity-Rayleigh's and Buckingham methods- Model study and similitude – scale effects and distorted model

**UNIT III – MOMENTUM PRINCIPLE**

**(10)**

Impulse momentum Principle- impact of Jet – force exerted by a jet on normal, inclined and curved surfaces for stationary and moving vanes- Angular momentum principle- Inlet and outlet flow diagrams

**UNIT IV – TURBINES**

**(10)**

Turbines – classification – radial flow turbines – axial flow turbines – Impulse and Reaction Turbines – work done and efficiency – draft tube theory- types – Similarity laws – specific speed- operating characteristic curves of turbines – Governing and Selection of Turbines

**UNIT-V PUMPS**

**(09)**

Centrifugal pump- Work done and Efficiency – minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - Work done and Efficiency- negative slip - flow separation conditions – air vessels – indicator diagram and its variation – savings in work done

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. R.K.Rajput., "A text Book of Fluid Mechanics", S.Chand and Company, New Delhi, 2007
2. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics", Including Hydraulic Machines, Standard Book House, Newdelhi, 2002
3. R.K.Bansal, "Fluid Mechanics and Hydraulic Machines", Lakshmi Publications, NewDelhi, 2002.

**Reference Books**

1. Natarajan M.K, "Principles of Fluid Mechanics", Anuradha Agencies, Vidayal Karuppur, Kumbakonam, 1995.
2. Subramanya K., "Flow in Open channels", Tata McGraw-Hill Publishing Company, 1994.
3. S.Ramamurtham and R.Narayanan, "Hydraulics Fluid Mechanics and Fluid Machines" Dhanpat rai Publishing Co. (P) Ltd, NewDelhi, 2000.

12C405 SURVEYING – II

L T P C

3 0 0 3

(09)

**UNIT I - TACHEOMETRIC SURVEYING**

Tacheometric systems-Tangential, Stadia and Subtense methods-Stadia systems-Horizontal and inclined sights-Vertical and normal staffing-Fixed and Movable hairs-Stadia constants-Anallactic lens –Subtense bar.

(09)

**UNIT II - CONTROL SURVEYING**

Vertical and horizontal control-Triangulation-Different-Networks, Orders and Accuracies. Signals and Towers Trilateration, Base line-Instruments and Accessories-Corrections-Satellite stations- Reduction to centre-Trigonometric leveling-Single and reciprocal observations.

(09)

**UNIT III - SURVEY ADJUSTMENTS**

Errors-Sources, Precautions and corrections-Classification of errors-true and most probable values- Weighted observations-Method of equal shifts-Principle of least squares-Level nets-Normal equations-Correlates.

(09)

**UNIT IV- CURVES**

Simple curves-Setting out-Linear and angular methods –Rankines tangential angles-Double Theodolite method-Difficulties in setting out-Compound and Reverse curves-parallel tangents in railway sidings- Setting out of Vertical Curves.

(09)

**UNIT V- GIS , GPS AND HYDROGRAPHIC SURVEYING**

Introduction to GPS and GIS - Operating Principle.Tides-types, gauges-Shore line theory-Soundings-Methods-Reduction-Plotting Engineering surveys- Route survey.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Kanetkar.T.P.,and Kulkarni.S.V., "Surveying and leveling", Vol I & II,Pune Vidyarthi Griha Prakashan,2004.
2. Duggal S.K, "Surveying", Vol. I & II, Tata McGraw-Hill, Publishing Company, 2004.

**Reference Books**

1. Punmia B.C, "Surveying", Vol. I & II, Laxmi Publication, 2007
2. Bannister . A & Reynolds . S, "Surveying", ELBS, 1992

**12C401 NUMERICAL METHODS**  
(COMMON TO CIVIL,EEE,EIE,CSE,IT BRANCHES)

**L T P C**  
**3 1 0 4**

**UNIT I: SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS**

(09)

Iterative method – Newton – Raphson Method for single variable and for simultaneous equations with two variables – Solutions of Linear system by Gauss elimination, Gauss – Jordan, Crout's and Gauss Seidel Methods – Relaxation Method – Eigen value of a Matrix by Power Method.

**UNIT II: INTERPOLATION**

(09)

Operators – Relation between the operators – Newton's divided difference formula – Lagrange's and Hermite's Polynomials – Newton Forward and Backward difference formulae – Stirlings and Bessel's Central difference formulae.

**UNIT III: NUMERICAL DIFFERENTIATION AND INTEGRATION**

(09)

Numerical differentiation with Interpolation Polynomials – Numerical Integration by Trapezoidal and Simpson's (Both  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$ ) rules – two and three point Gaussian quadrature formula – Double integrals using Trapezoidal and Simpson's Rules – Difference equation.

**UNIT IV : INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS**

(09)

Single step methods – Taylor series, Euler and Modified Euler, Runge – Kutta method of order four for first order differential equations – Multistep methods – Milne and Adam – Bashforth predictor and Corrector methods.

**UNIT V: BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**

(09)

Finite difference solutions for the second order ordinary differential equations – Finite difference solutions for one dimensional Heat equation (Both Implicit and Explicit) – One dimensional Wave equation – Two dimensional Laplace and Poisson equations.

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs**

**Text Books**

1. Dr. Kandasamy. P, Dr.Thilagavathy. K, Dr. Gunavathy. K., "Numerical methods", S. Chand and Co., New Delhi, 2010.

**Reference Books**

1. *Veerarajan. T and Ramachandran. T., "Numerical Methods with Programming in C", Tata Mc.Graw Hill Publishers, New Delhi, 2007.*
2. *Balagurusamy .E. "Numerical Methods", Tata McGraw Hill Publishers, New Delhi, 1999, reprint 2007.*
3. *Grewal. B. S. and Grewal. J.S., "Numerical Methods in Engineering and Science", (Sixth Edition), Khanna Publishers, New Delhi, 2004.*
4. *Gerald.C.F. and Wheatley. P.O., "Applied Numerical Analysis", (Sixth Edition), Pearson Education,Asia, New Delhi, 2006.*
5. *Sankar Rao K, "Numerical Methods for Scientists and Engineers", (Third edition), Prentice Hall of India, New Delhi , 2007.*
6. *Dr.Manish Goyal , "Statistics and Numerical methods", University Science Press, New Delhi, 2010.*
7. *Dr.J.S.Chitode, "Numerical Methods ", Technical Publications, Pune, 2010.*

12C402 MECHANICS OF SOLIDS – II

L T P C  
3 1 0 4

**UNIT I – DEFLECTION OF BEAMS**

(09)

Deflection Curve – Differential Equation – Double Integration Method – Macaulay's Method – Area Moment Method (Stepped Beams) – Conjugate Beam Method – Strain Energy and Dummy Unit Load Approaches – Castigliano's First and Second Theorems.

**UNIT II – STATICALLY INDETERMINATE BEAMS**

(09)

Propped Cantilever Beams – Fixed Beams – Continuous Beams – Theorem of Three Moments – Calculation of reactions, Bending Moments and Shear Force – Shear Force and Bending Moment Diagrams (for all Types of Loadings, Couple).

**UNIT III – THEORY OF COLUMNS**

(09)

Members Subjected to Axial Load – eccentric load – Slenderness Ratio – End Conditions – Buckling Load for Columns – Euler's Theory – Assumptions and Limitations – Rankine-Gordon Formula – Empirical Formula – Straight Line Formula – Columns Subjected to Eccentric Loading.

**UNIT IV – UNSYMMETRICAL BENDING AND SHEAR CENTRE**

(09)

Stresses due to Unsymmetrical Bending of Beams for Symmetrical Sections – Shear Centre - Definition – Shear Centre for Sections Symmetrical about One Axis – Moment of Inertia – Product of Inertia – Principal Area and Principal Moment of Inertia – Deflection of Beams due to Unsymmetrical Bending.

**UNIT V – THICK CYLINDERS**

(09)

Lame's Equation – Hoop Stress and Radial Stress Distribution – Compound Cylinders – Wire Wound Cylinders – Shrink Fit.

**THEORIES OF ELASTIC FAILURE:**

Theories of Elastic Failure – Factor of Safety – Graphical Representation of Theories for Two Dimensional Stress System.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

*Text Books*

1. Sadhu Singh, "Strength of Materials", Khanna publishers, New Delhi, 2000
2. Vaidyanathan.R, Perumal.P and Lingeswari.S "Mechanics of Solids and Structures" Volume I, Scitech Publications Pvt Ltd, Chennai, 2006.
3. Rajput.R.K, "Strength of Materials", S. Chand & Co., New Delhi, 2007.



**Reference Books**

1. Prasad.I.B, "Strength of Materials", Khanna Publishers, New Delhi, 1998.
2. James .M. Gere "Mechanics of Materials", Thomson India, Brooks/Cole, 2006.
3. Robert L.Mott, "Applied Strength of Materials", PHI Learning Pvt Ltd., New Delhi, 2009
4. Timoshenko.S.B and Gere.J.M, "Mechanics of Materials", Van Nos Reinhold, New Delhi, 1995.
5. Kazimi, "Solid Mechanics", Tata McGraw Hill, 1998.
6. Punmia B C, Jain Ashok and Jain Arun. "Strength of Materials and Theory of Structures" – Vol. I, Laxmi Publications Pvt. Ltd., New Delhi, 2000.
7. Bansal R K "Strength of materials", Laxmi Publications, New Delhi, 2007.
8. Khurmi, R.S, "Strength of Materials", 23<sup>rd</sup> Edition, S.Chand & Co, 2008.

12C406 WASTE WATER ENGINEERING

L T P C

3 0 0 3

(09)

**UNIT I - QUANTITY, COLLECTIONS AND CONVEYANCE**

Necessity and objectives of sanitary engineering projects - Definitions - systems of sewerage - quantity of sewage - Fluctuations in flow pattern - Estimation of storm runoff - DWF and WWF - Design flow for separate and combined systems - House drainage - Sanitary fixtures / fittings - one pipe system, two pipe system, etc. - General layout of house drainage - street connections.

(09)

**UNIT II - SEWER AND SEWER APPURTENANCES**

Hydraulics of sewers - Self cleansing velocities - full flow / partial flow conditions - sewer sections - sewer appurtenances - Design principles and procedures - materials for sewers - sewer joints - sewer laying - sewer cleaning and maintenance - sewage pumping - types of pumps.

(09)

**UNIT III - QUALITY OF SEWAGE AND PRIMARY TREATMENT**

Characteristics and composition of sewage - physical and chemical analysis - DO, BOD, COD and their significance - cycles of decomposition - Objectives and basic principles of sewage treatment - primary treatment - screens - Grit chamber - settling tank - principles of sedimentations - Design of settling tanks.

(09)

**UNIT IV - BIOLOGICAL TREATMENT OF SEWAGE**

Basic principles of biological treatment - Filtration - contact beds - Sand Filters - trickling filters - Description and principles of operation of standards / high rate filters - recirculation - activated sludge process - diffuser / Mechanical aeration - Conventional, high rate and extended aeration process - oxidation pond - stabilization ponds - aerated lagoons - Septic tanks and effluent disposal system.

(09)

**UNIT V - SEWAGE DISPOSAL AND SLUDGE MANAGEMENT**

Objectives of sludge treatment - properties and characteristics of sludge - Thickening - sludge digestion - drying beds - conditioning and dewatering - sludge disposal - Eutrophication - recycle & reuse of waste effluents - elutriation - Methods - dilution method - self purification of streams - oxygen sag curve - land disposal - sewage farming.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Garg, S. K., "Environmental Engineering", Vol I & Vol II, Khannah Publishers, New Delhi, 1994.
2. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India 2008
3. Hussain, S. K., "Text Book of Water Supply and Sanitary Engineering", Oxford and IBH Publishing.
4. Duggal, K.N., "Elements of public Health Engineering", S.Chand and Company Ltd, New Delhi. 1998.

**Reference Books**

1. *Manual on wastewater and treatment* CPHEEC, Ministry of Urban Affairs and Employment, Govt. of India, New Delhi, 1990.
2. Shah.C. S., "*Water supply and Sanitation*", Galgotia publishing company, New Delhi, 1994.

**12C502 BASIC STRUCTURAL DESIGN – I**

**(Masonry, Timber and Steel)**

*(Use of IS 800, steel tables, IS: 1905, IS 883 and Timber codes are permitted)*

**L T P C**

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**UNIT I - MASONRY**

**(09)**

Mix proportions – compressive strength of mortars – basic compressive stress – design of masonry walls – eccentrically loaded walls – shape factor for masonry units – stability of piers and walls – design as per IS Codes.

**UNIT II - TIMBER**

**(09)**

Allowable stresses in compression, tension and flexure – types of joints with nails and bolts – Design of simple compression members – design of beams for strength and stiffness as per BIS code

**UNIT III - STRUCTURAL STEEL CONNECTIONS**

**(10)**

Steel standard sections – properties – permissible stresses as per BIS codes

***Bolted connections***

Types of bolts – permissible stresses for black bolt, HSFG bolts as per BIS code – Resistance of a bolt in single shear and double shear and bearing – Design for eccentric loading - Field examples.

***Welded connections***

Principle of welding – methods of welding – weld symbols – edge preparation – welding electrodes – types of welded joints – strength of fillet and butt weld – design of welded connections for lap and butt joint and detailing - Design for eccentric loading - Field examples.

**UNIT IV - BEAMS (Bolted and welded connections only)**

**(08)**

Beams – permissible bending stress as per BIS code - section classification – Design of laterally supported and unsupported simply supported beams – Design of built – up beams – curtailment of flange plate – connection between flange plate and beam – need for lateral support of compression flange and their design – strength of beams in shear.

**UNIT V - COMPRESSION AND TENSION MEMBER (Bolted and welded connections only)**

**(09)**

Axially loaded columns – effective length of compression members – slenderness ratio – strength of compression members – design of columns – built up columns – design of lattices and battens – design of their base – Gusseted base – design of simple and built up members subjected to tension – effective area of angle and Tee sections connected to Gussets – Tension splice – lug angle

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs**

**Text Books**

1. Arya, "Structural Design in Steel, Masonry And Timber", Nemchand & Bros., Roorkee, 1993.
2. Subramanian.N "Design of Steel Structures", Oxford University Press, New Delhi, 2008.
3. Duggal.S.K., "Limit State Design of Steel Structures", Tata McGraw Hill ,New Delhi, 2010.

**Reference Books**

1. Ramachandra, " Design of Steel Structures", Vol. I & II, Standard publishing house, New Delhi, 2007.
2. B. C. Punmia, Ashok Kumar Jain and Arunkumar Jain, "Design of Steel Structures, Vol. I & II", Arhant Publications, Bombay, 2004
3. P. Dayaratnam, "Brick and reinforced brick structures", Oxford and IBH publishing house, 1997.
4. BIS: 1905 – 1980, Code of practice for structural safety in buildings reinforced masonry
5. IS: 800 – 2007, Code of practice for general construction in steel (Third revision)
6. BIS – SP 6(I) – Handbook for structural steel sections

**12C505 MECHANICS OF SOILS**

**L T P C**

**3 1 0 4**

**UNIT-I BASIC PROPERTIES OF SOILS**

**(09)**

Soil formation – Soil problems in Engineering – Physical properties of soil – Phase relations – Index properties of soil – Grain size distribution – Atterberg limits – Soil classification-different methods- their significance – BIS classification system – Field identification – Simple tests.

**UNIT-II STRESSES IN SOILS**

**(09)**

Soil water statics – Concept of effective and neutral stresses – Capillary phenomenon – Vertical stress distribution in soils – Boussinesq equation – Line load – Uniformly distributed loads – New marks chart – Construction and use – Approximate methods – Pressure bulb – Westerguards equation.

**UNIT-III PERMEABILITY AND SEEPAGE**

**(09)**

One dimensional flow through soil – permeability – Darcy's law – field and laboratory permeability tests – Flow through stratified soil – Seepage pressure – Quick sand condition – Soil liquefaction – Two dimensional flow – Laplace equation – Electrical analogy – Flow net – Methods of construction – Properties – Applications – Sheet pile cut off and earth dam – Phreatic line.

**UNIT-IV COMPACTION AND CONSOLIDATION**

**(09)**

Compaction – Laboratory test – Standard proctor's compaction – Modified proctors compaction – Moisture density relation – Factors affecting compaction – Field compaction methods – Compaction control.

Consolidation – Consolidation settlement – Laboratory test – Determination of  $C_v$  by curve fitting methods – Terzaghi's one dimensional consolidation – Definition of terms – Normally consolidated clay – Over consolidated clay – Under consolidated clay – Field curve – Pre consolidation pressure –  $e$  vs  $p$  curve – Boundary condition – Time factor – Time rate of consolidation.

**UNIT-V SHEAR STRENGTH**

**(09)**

Shear strength of soil – Importance and use – Mohr – Coulomb's theory – Factors affecting the shear strength – Laboratory test – Direct shear test – Triaxial compression test – Triaxial tests based on drainage conditions – Cyclic loading – Pore pressure parameters – UCC test – Vane shear test – Insitu vane shear test.

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs**

**Text Books**

1. Arora. K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2005.
2. GopalRajan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, Third Edition, New Delhi, 2006.

**Reference Books**

1. Punmia. B.C., "*Soil Mechanics and Foundations*", Laxmi Publications Pvt. Ltd., New Delhi, 2005.
2. Venkataramaiah. C, "*Geotechnical Engineering*" Wiley Eastern Ltd., New Delhi, 2001.
3. Murthy. V.N.S., "*Soil Mechanics and Foundation Engineering*", DhanapatRai Publication, 2000.
4. Teng. W.L., "*Foundation Design*" Prentice Hall of India Ltd., New Delhi, 1969.

**12C602 BASIC STRUCTURAL DESIGN II (CONCRETE )**

**L T P C**

**3 1 0 4**

**UNIT – I REINFORCED CONCRETE MATERIALS**

**(08)**

**Materials:**

Stress strain curve for concrete – Standard concrete mixes for RCC works – types of Reinforcements – plain and deformed bars – Stress – strain curve for reinforcing steel.

**Design concepts:**

Design philosophy – Characteristic load and strength – permissible stresses – partial safety factors – limit state of collapse – limit state of Serviceability – Durability limit state – deflection and cracking – modification factors.

Basic design concepts – working stress and limit state methods.

**UNIT – II LIMIT STATE DESIGN OF BEAMS**

**(10)**

Design of singly and doubly reinforced rectangular and flanged sections by limit state method with IS code specifications – Analysis and design of singly and doubly reinforced rectangular and flanged beams. Design of sections subjected to the combined action of bending moment, transverse shear and torsion

**UNIT – III LIMIT STATE DESIGN OF SLABS**

**(10)**

Behaviour of one way & two way slabs – Design of one way slab – span / effective length ratio – two way slab – Analysis, design and detailing of rectangular slabs subjected to uniformly distributed load. Design of lintel and lintel cum sunshade – Design of stair case.

**UNIT – IV LIMIT STATE DESIGN OF COLUMNS**

**(8)**

Types of columns – Effective length of columns - Design of rectangular and circular columns for axial load – Codal Provisions for the analysis of columns subjected to axial load and uniaxial bending – Design of short columns subjected to axial load and uniaxial/ biaxial bending moment using interaction charts.

**UNIT – V LIMIT STATE DESIGN OF FOOTINGS**

**(09)**

Design of wall footing – strip foundation to wall under axial load, eccentric load – Design of isolated footing for axially loaded columns.

**LECTURE: 45 TUTORIAL: 15 TOTAL:60hrs**

**Text Books**

1. Varghese P.C., "Limit State Design of Reinforced Concrete", Prentice hall of India Pvt. Ltd., 2004.



2. Krishna Raju, N and Pranesh, R.N., "Reinforced Concrete Design – IS 456 – 2000 Principles and Practice", New Age International Publishers, New Delhi, 2003.
3. Syal I.C., and Goel A.K., "Reinforced Concrete Structure", A.H. Wheeler & Co, 2004.

**Reference Books**

1. BIS 456 – 2000, Indian Standard code of practice for Plain and Reinforced concrete (Fourth revision)
2. Dayaratnam P., "Design of Reinforced Concrete Structures", Oxford & IBH publishing Co.Pvt. Ltd., 2003.
3. Pillai, S. U., and Menon, D., Reinforced Concrete Design Tata McGraw Hill, 2003.
4. Ashok K. Jain, "Reinforced Concrete – Limit State Design" – Nem Chand & Bros., 2003.
5. Sinha.W.C and Roy., " Fundamentals of Reinforced Concrete", Chand and Co., 2005.
6. Sinha.S.N, "Reinforced Concrete Design", Tata McGraw Hill publishing company Ltd., 2005.

12C503 WATER RESOURCES ENGINEERING

L T P C  
3 0 0 3

**UNIT – I SURFACE WATER HYDROLOGY**

(09)

Hydrological Cycle – Precipitation – forms and types – Rain gauges – average rainfall over a basin - Arithmetic mean, Thiessen polygon and Isohyetal method - missing precipitation – optimum number of rain gauge station – Runoff process – infiltration, evaporation, transpiration and depression storage. Estimation of Runoff - Empirical formula and Infiltration Indices. Storm Hydrograph and Unit Hydrograph – Flood estimation by Empirical formulae - recurrence interval – rational method.

**UNIT – II RESERVOIR PLANNING**

(09)

Purpose of storage work – types of reservoirs – Investigation for reservoir planning – Selection of site for a reservoir – Yield of a reservoir – Safe, secondary and average yield – mass curve and demand curve - Calculation of safe yield from a reservoir of a given capacity - Calculation of reservoir capacity for a specified yield – Zones of storage in reservoirs – Single and multipurpose reservoir – Reservoir sedimentation and their control – trap efficiency - Basics of flood routing.

**UNIT – III GROUND WATER HYDROLOGY**

(09)

Occurrence of ground water – types of aquifers – zones of underground water - storage coefficient – coefficient of transmissibility – Steady radial flow into a well located in unconfined and confined aquifers - Description of various types of open and tube wells – Yield from an open well by constant level pumping test and recuperation test – well loss - Site selection for a tube well – Problems.

**UNIT – IV DISTRIBUTION SYSTEM**

(09)

Classification of canals – canal alignment – Design procedure for an unlined irrigation channel - Kennedy's theory – Wood table – Lacey's theory – Comparisons of the two theories – Use of Garret's diagram in channel design – Balancing depth of cutting – types of canal cross section – component parts of a cross section – Canal lining - Design of lined canals – Problems.

**UNIT – V WATER LOGGING, DRAINAGE AND RIVER CONTROL**

(09)

Water logging – Causes and effects of water logging – Remedial measures – Land Drainage – Advantages – Types of drainage system – layout of tile drainage. Rivers – classifications – Meandering and cut-off – River training works - Objectives – Classification and Types of river training works.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Punmia .B.C. and Pande B.B.Lal, "Irrigation and Water Power Engineering", Laxmi Publications Pvt.Ltd, New Delhi, 2009.
2. Santosh Kumar Garg, "Irrigation Engineering and Hydraulics Structures", Khanna Publications Pvt.Ltd, New Delhi, 2009.

**Reference Books**

1. Duggal.K.N and Söni. J.P, "*Elements of Water Resources Engineering*", New Age International Pvt.Ltd, New Delhi, 2005.
2. Gupta.B.L and Amit Gupta, "*Water resources system and management*", Standard Publishers Distributors, New Delhi, 2007.

**12C302 ENVIRONMENTAL SCIENCE AND ENGINEERING**

(Common to all branches)

**L T P C**

**3 0 0 3**

**UNIT-1 ENVIRONMENTAL RESOURCES**

**(09)**

Earth structure, Internal and external earth processes, plate tectonics, erosion, weathering, deforestation, anomalous properties of water, hydrological cycle, effect of modern agriculture, fertilizers, pesticides, eutrophication, biomagnifications, land degradation, minerals, rocks, rock cycle, mining, types of mining, desertification, soil erosion, methods of conservation of soil erosion, renewable energy resources, wind, solar, geothermal, tidal, OTEC.

**UNIT-2 ECO SYSTEM AND BIODIVERSITY**

**(09)**

Weather and climate, ocean current, upwelling, EL Nino, Ecology, ecosystem, biomes, physical and chemical components of ecosystem, biological components of ecosystem, forest ecosystem, desert ecosystem and pond ecosystem, Energy flow in ecosystem, nitrogen cycle, carbon dioxide cycle, phosphorous cycle, food pyramid, Ecological succession, types, biodiversity, need for biodiversity, values of biodiversity, hot spots of biodiversity, endangered and endemic species, conservation of biodiversity insitu-exitu conservation.

**UNIT-3 ENVIRONMENTAL POLLUTION**

**(09)**

Air pollution, classification of air pollutants gaseous particulars, sources effects and control of gaseous pollutants SO<sub>2</sub>, NO<sub>2</sub>, H<sub>2</sub>S, CO, CO<sub>2</sub> and particulates, control methods, cyclone separator, electrostatic precipitator, catalytic combustion-water pollution-classification of water pollutants, inorganic pollutants, sources, effects and control of heavy metals, organic pollutants, oxygen demanding wastes, aerobic and anaerobic decomposition, soil pollution, Noise pollution, sources, effects, decibel scale.

**UNIT-4 ENVIRONMENTAL THREATS**

**(09)**

Acid rain, green house effect, global warming, disaster management, flood, drought, earthquake, tsunami, threats to biodiversity, destruction of habitat, habit fragmentation- hunting, over exploitation – man- wildlife conflicts, The IUCN red list categories, status of threatened species.

**UNIT-5 SOCIAL ISSUES AND ENVIRONMENT**

**(09)**

Sustainable development- sustainable technologies, need for energy and water conservation, rain water harvesting, water shed management, waste land reclamation, Air act, Wild life protection act, forest conservation act, population growth, exponential and logistic growth, variation in population among nations, population policy, women and child welfare programs, Role of information technology in human and health, HIV/AIDS, effects and preventive measures.

**LECTURE: 45 TOTAL: 45 hrs**

**Text Books**

1. Sharma J.P., '*Environmental Studies*', 3<sup>rd</sup> Edn, University Science Press, New Delhi (2009)
2. Anubha Kaushik and C.P.Kaushik, '*Environmental Science and Engineering*', 3<sup>rd</sup> Edn New age International Publishers, New Delhi (2008)

**Reference Books**

1. R.K.Trivedi, '*Hand book of Environmental laws, Rules, Guidelines, Compliances and Standards*', Vol.I &II, Environ Media.(2006)
2. G Tyler Miller, J<sub>r</sub>, '*Environmental Science*', Tenth Edition, Thomson BROOKS/COLE (2004)
3. Gilbert M.Masters, '*Introduction to Environmental Engineering and Science*', 2<sup>nd</sup> Edition Pearson Education (2004).

12C604 FOUNDATION ENGINEERING

L T P C  
3 0 0 3

**UNIT-I SELECTION OF FOUNDATION AND SOIL EXPLORATION**

(09)

Types of foundation – Requirements of good foundation – Factors governing location and depth — Choice of types of foundation. Soil exploration – Methods – Augering and boring – Wash boring and rotary drilling – Depth of exploration – Samples – Disturbed and undisturbed – Samplers – Number and spacing of bore holes – Sounding tests – SPT – SCPT – DCPT – Bore log.

**UNIT-II BEARING CAPACITY**

(09)

Bearing capacity – Terzaghi's formula – Types of failure – Effect of water table – Shape of foundation – Skempton's formula – Meyerhoff's formula – Hansen's formula – Inclination of load and eccentricity of load on bearing capacity – BIS formula - Bearing capacity based on 'N' value. Allowable bearing pressure — Plate load test – Seismic consideration in bearing capacity evaluation – Introduction to methods improving bearing capacity.

**UNIT-III SETTLEMENT AND DESIGN OF FOUNDATION**

(09)

Settlement – Immediate and time dependent settlements – Differential settlement – Causes – Effect – Control – Permissible settlement – BIS code provisions – Contact pressure distribution – Design – Proportioning – Isolated footing, combined footing and strap footing – raft foundation – Types – Floating foundation.

**UNIT-IV PILE FOUNDATIONS**

(09)

Classification of piles – Functions – Merits – Load carrying capacity – Dynamic analysis – Hammers – Static analysis – Pile load test – Capacity from penetration test - Pile group (Feld's rule, Converse – Labarre formula and block failure criterion) – Spacing and group action – Efficiency of pile group – Settlement – Negative skin friction – Underreamed pile foundation.

**UNIT-V STABILITY OF SLOPES AND EARTH PRESSURE**

(09)

Stability of slopes – Infinite and finite slopes – Types of failure – Slip circle method – Friction circle method – Taylor's stability chart. Lateral earth pressure – Plastic equilibrium – Rankine's theory – Surcharge – Inclined backfill – Stratified backfill – Coulomb's theory – Earth pressure on retaining walls of simple configurations – Graphical constructions (Rebhan's and Culmann's graphical procedure) – Stability analysis of retaining wall – Drainage of backfill.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Arora. K.R., "*Soil Mechanics and Foundation Engineering*", Standard Publishers and Distributors, New Delhi, 2005.
2. Punmia. B.C., "*Soil Mechanics and Foundations*", Laxmi Publications Pvt. Ltd., New Delhi, 2005.
3. Varghese. P.C., "*Foundation Engineering*", Prentice Hall of India Pvt. Ltd., New Delhi, 2005.

**Reference Books**

1. Gopal Rajan and Rao, A.S.R., "*Basic and Applied Soil Mechanics*", New Age International Publishers, Third Edition, New Delhi, 2006.
2. Venkataramaiah. C., "*Geotechnical Engineering*" Wiley Eastern Ltd., New Delhi, 2001.
3. Murthy. V.N.S., "*Soil Mechanics and Foundation Engineering*", DhanapatRai Publication, 2000.
4. Teng. W.L., "*Foundation Design*" Prentice Hall of India Ltd., New Delhi, 1969.

12C601 STRUCTURAL ANALYSIS – II

L T P C  
3 1 0 4  
(09)

**UNIT – I SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD**

Degree of static and kinematic indeterminacy:

Analysis of continuous beams - Sinking of Supports – Analysis of single storey and single bay rectangular vertical frames with and without sway - Slope Deflection Method.

Carry over factor – Distribution factor – Analysis of continuous beams – Sinking of Supports – Analysis of single storey and single bay rectangular vertical frames with and without sway - Gable portals – Moment Distribution Method.

**UNIT – II ANALYSIS OF PLANE AND SPACE TRUSSES**

(09)

Analysis of plane with maximum two redundant members by displacement and force methods – Continuous trusses – Trusses with lack of fit – Thermal Stresses – Settlement of support – Trussed Beams – Analysis of Space trusses using method of tension coefficients.

**UNIT – III FRAME ANALYSIS**

(09)

Analysis of multistoreyed building frame for horizontal loads by portal method and cantilever method.

Analysis of multistoreyed building frame for vertical loads by two cycle moment distribution method-using substitute frames.

**UNIT – IV MATRIX FLEXIBILITY METHOD**

(09)

Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of static indeterminacy.

**UNIT – V MATRIX STIFFNESS METHOD**

(09)

Analysis of continuous beams, indeterminate frames and trusses with maximum three degrees of kinematic indeterminacy.

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs**

**Text Books**

1. Punmia B.C, "Strength of Materials and Mechanics of Structures" Vol.II, Standard Publishers, 2007.
2. Pandit.G.S.and Gupta S.P, "Theory of Structure", vol.I, Tata McGraw-Hill, New Delhi, 2003.
3. Vaidyanathan.R, Perumal.P, "Comprehensive Structural Analysis", Vol I and II, Laxmi Publications, 2008.



**Reference Books**

1. Sterling Kinney, J. "Indeterminate Structural Analysis", Narasa Publishing House, Delhi, 1987.
2. Meek J. I., "Matrix Structural Analysis", McGraw-Hill Book Company, 1971.
3. Nègi, L.S. and Jangid, R.S., "Structural Analysis", 6<sup>th</sup> Edition, Tata McGraw-Hill Publications, 2003.
4. Rajasekaran S. and Sankarasubramanian .G, "Computational Structural Mechanics", Prentice Hall of India, 2001.
5. Manickaselvam. V.K., "Elementary Matrix Analysis of Structures", Khanna Publishers, New Delhi, 1994.
6. Bhavikatti. S.S., "Structural Analysis", Vol. I and II, Vikas Publishing House Pvt. Ltd., 2008.
7. Reddy. C.S., "Basic Structural Analysis", Third Edition, Tata McGraw-Hill Publications, 2011.

12C506 HIGHWAY ENGINEERING

L T P C

3 0 0 3

**UNIT-I HIGHWAY PLANNING & FINANCING**

(09)

Importance of Highway Transportation- Classification of Highways- Scope, advantages and important highway plans - Highway financings - Calculation of Annual cost - Economic analysis - methods- Highway location and surveys.

**UNIT-II GEOMETRIC DESIGN OF HIGHWAYS**

(09)

Introduction - Design Parameters-PCU, Design Vehicle, speed, gradient, Camber, super elevation, - Typical cross sections, Sight distance- Types-Horizontal & Vertical alignment- Design of curves - curve widening- Intersections- problems

**UNIT-III HIGHWAY MATERIALS AND CONSTRUCTION**

(09)

Testing of Highway materials - Tests on soils, aggregates and Bitumen - CBR Test - Equipments used in Highway construction - Stages of highway construction - Soil stabilization - Bituminous pavement construction - Water bound Macadam roads - Cement concrete pavement construction.

**UNIT-IV FLEXIBLE & RIGID PAVEMENTS**

(09)

General principles - Factors affecting pavement stability - Flexible pavement design methods - Empirical methods - Using soil classification - using soil strength - Rigid pavement design methods - Stress in concrete pavement - Westerguard analysis - Types of rigid pavements - Design of pavement thickness - Design of joints.

**UNIT- V PAVEMENT EVALUATION AND MAINTENANCE**

(09)

Structural evaluation - Lab and field test methods - Strengthening of pavements - Types of overlays - Highway drainage -Types - Maintenance of different road surfaces - Maintenance of shoulders, roadway drainage and other structures.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Khanna and Justo, "Highway Engineering", Nemchand and Bros 2005.
2. Kadiyali, L.R., "Transport planning and traffic engineering", Khanna Publication. 2003.

**Reference Books**

1. Sharma S.K, "Principles, Practice & Design of Highway Engineering" S.Chand & Co, 2001.
2. IRC codes 15 -1981, 37 - 4984, 38 - 1988, 52 1981, 58 - 1988, 66 - 1976, 73 -1980 and IRC SP 23 - 1983.

**12C702 STEEL STRUCTURES**

**L T P C**

**3 1 0 4**

**UNIT- I BUILT UP GIRDERS**

**(09)**

Design of bolts and welded connections (Stiffened and seated connections) - Design of welded plate girders - Design of stiffeners and splices - Design of girders with unrestrained compression flange - design of gantry girders.

**UNIT- II ROOF TRUSSES AND INDUSTRIAL BUILDINGS**

**(09)**

Roof trusses - Dead, live and wind loads - types of roof trusses - Design of purlins - design of roof trusses. Industrial building - structural frame work for braced and unbraced - bracing of industrial buildings (types and principles only)

**UNIT- III CHIMNEYS**

**(09)**

Design of chimneys - self supporting type - Guyed type at single level - Foundations for Chimneys.

**UNIT- IV WATER TANKS**

**(09)**

Types of steel water tank - rectangular and cylindrical with hemispherical water tanks - design of staging and foundation

**UNIT- V PLASTIC THEORY**

**(09)**

Plastic bending of beams - plastic moment capacity of sections - plastic section modulus - shape factor for rectangular, triangular, circular and hollow circular sections - Plastic hinge concept - Load factor - plastic analysis - Basic theorems - Principle of virtual work - Determination of collapse load for simply supported beam, propped cantilever beam, fixed beam, continuous beam subjected to concentrated loads and UDL - collapse load for single storey single bay portal frames.

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs**

**Text Books**

1. Duggal S.K., "Design of Steel structures", Tata McGraw Hill., and New Delhi.2009.
2. Subramanian.N., "Design of steel structures", Oxford university press, 2008
3. Duggal S.K.. " Limit State Design of Steel Structures", Tata McGraw Hill., and New Delhi.2010.

**Reference Books**

1. Arya A.S and Ajmani J.L, "Design of Steel structures". Nem Chand and Bros. Roorkee,2000.
2. Bhavikatti.S.S. , "Design of steel Structures",I.K.International Pvt Ltd,2009

3. Ramachandra, **"Design of Steel structures"** Vol I & II. Standard Book House, New Delhi, 2005.
4. Salmon C.G and Johnson J.E, **"Steel Structures and Behaviour"**, Harper and row, Cambridge.
5. IS:800-2007, Code of practice for general construction in steel ( Third revision )
6. BIS: SP 6(I) – Hand book for structural steel sections.
7. P.Dayaratnam **"Design of steel structures"**,,S.Chand Publishers 2011-12
8. **"Teaching Resources for Structural Steel Design-Vol I&II"**-INSDAG,Kolkatta
9. M.RShiyekar, **"Limit State Design of Steel Structures"**, PHI Learning Private Ltd,New Delhi,2011.

**12C504 CONCRETE TECHNOLOGY**

*(Use of Mix Design Tables and Charts are permitted)*

**L T P C**

**3 0 0 3**

**UNIT I - INGREDIENTS OF CONCRETE**

**(09)**

Cement – constituents- Hydration – Tests on cement – Types of cement – Aggregates – properties and uses – Classification of aggregates – Properties and test on aggregates – gradation – Quality of water – Admixtures – Accelerators – Retarders – Waterproofers – workability agents – air entraining agents – corrosion inhibitors – Curing compounds

**UNIT II – FORMWORK AND PRODUCTION OF CONCRETE**

**(09)**

Requirements of formwork – Economy in formwork – Materials for forms – Arrangement of forms for slabs, beam, column, walls, culverts, stairs etc – Removal of forms – Design considerations.

Measurement of materials – batching – Mixing – Transportation – Placing of concrete in cold weather, hot weather and under water concreting – Compaction – Curing

**UNIT III – PROPERTIES OF CONCRETE**

**(09)**

Properties of fresh concrete – Workability – Segregation – Bleeding – Properties of hardened concrete – Strength – Stress - Strain characteristics – Modulus of Elasticity – Shrinkage – Creep – Thermal properties – Permeability – Test for Tension, Compression and Flexure – Non-Destructive Test

**UNIT IV – CONCRETE MIX DESIGN AND QUALITY CONTROL OF CONCRETE**

**(09)**

Quality Control - Frequency of sampling – Statistical analysis of test results – standard deviation –

Coefficient of variation – Characteristic strength – Acceptance and rejection Criteria – Importance of water cement ratio – Importance of cover to concrete.

Nominal mixes – Design Mixes – factors influencing the design mix – Mix Design by ACI method,

IS method and DOE method

**UNIT V – SPECIAL CONCRETES**

**(09)**

High Strength- High Performance Concrete - reactive powder concrete - Light weight, heavy weight and mass concrete – Self Compacting Concrete – Self Curing Concrete – Polymer Concrete – Fibre Reinforced Concrete - Ready Mixed Concrete

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. *Shetty M.S., "Concrete Technology", S.Chand & Company, New Delhi, 2008*
2. *Santhakumar. A.R, "Concrete Technology", Oxford university press, 2007*
3. *M.L. Gambhir, "Concrete Technology", Tata Mc-Graw Hill Company, Noida, 2011*

**Reference Books**

1. *Orchard D.F., "Concrete Technology", Vol I & II, 1998*
2. *Neville A.M "Properties of Concrete", Pearson Education, 2008.*
3. *Povindar K. Mehta, Paulo J. M. Monteiro, "Concrete: Microstructure, Properties, and Materials", Mc-Graw Hill Company, 2011*

**12C703 CONCRETE STRUCTURES**

**L T P C**

**3 1 0 4**

**(09)**

**UNIT-I FOOTINGS**

Design of Eccentrically loaded footings for columns – combined rectangular footings – combined trapezoidal footings for axially loaded column - Strap beam footings – Design of mat and raft foundations.

**UNIT-II RETAINING WALLS**

**(09)**

Types of retaining walls – Cantilever retaining wall – check for structural stability – design of concrete thickness and reinforcement for stem, heel and toe slab – Counterfort retaining wall – check for structural stability – design of concrete thickness and reinforcement for stem, Counterfort, heel and toe slab - Curtailment of bars-Use of geomembranes.

**UNIT-III FLAT SLAB DESIGN**

**(09)**

Design loads other than earthquake loads (only an introduction) – Imposed loads, wind loads, construction loads.

Design by BIS code – middle panel and end panel – column strip – middle strip – with and without column head – reinforcement details.

**UNIT-IV WATER TANKS DESIGN (W.S.D)**

**(09)**

Design of underground and on ground rectangular and circular tanks – Overhead tanks of rectangular shape and circular shape with flat and domed roof – Design of all components including staging and foundation.

**UNIT- V EARTHQUAKE FORCES – DUCTILE DETAILING**

**(09)**

Earthquake forces – Bureau of Indian standards for Earthquake resistant design – earthquake magnitude and intensity – basic seismic coefficients and seismic zone factors – design forces – design factors – Analysis of structures – choice of method for multistoreyed buildings. Ductile detailing of frames for seismic forces – general principles.

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs**

**Text Books**

1. Varghese P.C., "Limit State Design of Reinforced Concrete", Prentice hall of India Pvt. Ltd., 2004.
2. Sinha.S.N. "Reinforced Concrete Design", Tata McGraw Hill publishing company Ltd., 2003.
3. Pankaj Agarwal and Manish ShriKhande, "Earthquake Resistant Design of Structures", Prentice- Hall of India, 2007, New Delhi

**Reference Books**

1. BIS 456 – 2000, *Indian Standard code of Practice for plain and Reinforced concrete (fourth revision)*
2. Dayaratnam P., *“Design of Reinforced Concrete Structures”, Oxford & IBH Publishing Co. Pvt. Ltd.,*
3. Ramchandra, *“Limit State Design”, Standard Book House, Delhi-6, 2002.*
4. 4.IS 13920(1993), *“Ductile detailing of Reinforced concrete structures subjected to seismic forces”, New Delhi.*
5. Syal.I.C & Goel.A.K, *“Reinforced Concrete Structures”, A.H. Wheeler and Co. Chennai – 2002*
6. Sinha. W. C. and Roy.S.K, *“Fundamental Reinforced Concrete”, S. Chand & Company Ltd, NewDelhi-6, 2002.*
7. Ramamurtham and Narayanan, *“Reinforced Concrete Structures”, Dhanpat Roy publishers, 2002.*



**12C605 DESIGN AND DRAWING -- I  
(IRRIGATION AND ENVIRONMENTAL ENGINEERING)**

**L T P C**  
**2 0 3 4**

**PART -- A**

**IRRIGATION ENGINEERING**

**(25)**

1. Tank Surplus Weir (Type A and D)
2. Tank Sluice with a Tower Head
3. Direct Sluice
4. Notch type Canal Drop
5. Canal Regulators and river regulators.
6. Cross-Drainage Works (Syphon Aqueduct type II & III)

**PART -- B**

**ENVIRONMENTAL ENGINEERING**

**(25)**

1. Intake tower
2. Sedimentation tank
3. Clariflocculator
4. Slow sand filters
5. Rapid sand filters
6. Secondary settling tanks
7. Trickling filter
8. Activated sludge process
9. Sludge digestion tank
10. Septic tank with dispersion trench and soak pit.

**QUESTION PAPER PATTERN :**

Question paper shall consist of two questions from each part. Part A consist of 60 marks and part B consist of 40 marks and the students have to answer one question from each part.

**LECTURE: 20 DRAWING: 30 TOTAL: 50hrs**

**Text Book**

1. Sathya Narayana Murthy Challa , *"Water Resources Engineering " Principles and Practice NewAgeInternational (P) Ltd., New Delhi -- 2005.*
2. Rangwala.S.C, *"Fundamentals of water supply and sewerage engineering", Charotar Publishing 2000.*

**Reference Books**

1. Santosh Kumar Garg, *Irrigation Engineering and Hydraulics Structures, Khanna Publications Pvt.Ltd, New Delhi, 2002.*
2. Birde.G.S and Birde.J.S, *"Water supply and sanitary Engineering", Dhanpat Rai Publications Pvt.Ltd New Delhi, 2001.*

12C708 COMPUTER APPLICATION LABORATORY

L T P C  
0 0 3 2

DEVELOPMENT AND IMPLEMENTATION OF PROGRAM USING SOFTWARE

(25)

1. Design of singly and doubly reinforced beams (Design and check for shear & deflection)
2. Design of one way slab and two way slab
3. Design of Flat slab
4. Design of columns
5. Design of RCC Retaining wall
6. Concrete mix design for M25 & M30 grade.

DEVELOPMENT AND IMPLEMENTATION OF PROGRAM USING STAAD PRO

(25)

1. Analysis & Design of 2D & 3D Truss
2. Analysis & Design of 2D & 3D Frames
3. Design and detailing of trusses & frames ( 2D & 3D)
4. Structural design of Steel Gable Frames
5. Analysis and Design of simple two storey buildings

TOTAL : 50 hrs

**Text Book**

1. Krishnamoorthy C.S., and Rajeev.S., "Computer Aided Design and Analytical tools", Narosa., 2000.

**12C701 PRESTRESSED CONCRETE STRUCTURES**

**L T P C**

**3 1 0 4**

**(09)**

**UNIT- I INTRODUCTION**

Principles – Pretensioning – Post – tensioning – Advantages and Types of prestressing – systems of prestressing – Comparison of prestressed concrete with reinforced concrete – Materials – Characteristics of concrete – Characteristics of high tensile steel.

Analysis and Behaviour:

Theory and behaviour of prestressed concrete beams in bending – calculating fibre stresses for various section

( Rectangle, I, T) of simply supported beam due to prestressing force, dead load and external live load- Stress method – Moment of resistance method – Load balancing method.

**UNIT- II DESIGN OF PRESTRESSED CONCRETE BEAMS**

**(09)**

Pre tensioned and post tensioned simply supported rectangle, I, T sections – Stress method – Design for flexure, bond and shear – IS Code provisions. End block: Introduction – Transmission length – End zone reinforcement – Anchorage zone stresses- Guyon and Magnel's method – Calculation of bearing stress and bursting tensile forces – Reinforcement in Anchorage zone.

**UNIT-III DESIGN OF TENSION AND COMPRESSION MEMBERS**

**(09)**

Design of prestressed tension members subject to axial load – Design of axially prestressed compression members subjected to axial compression load and Bending – Design of sleepers and poles.

**UNIT- IV LOSSES AND DEFLECTIONS**

**(09)**

Various losses in prestressed concrete members – Causes for losses in prestressed – calculation of losses – losses due to elastic shortening of pre tensioned and post tensioned members – losses due to creep , shrinkage of concrete – Relaxation losses – friction and anchorage losses.

Deflection of prestressed concrete flexural members due to prestressing force, dead load, live load- BIS Code provisions – Effect of tendon Profile on deflection - Calculation of Elastic short term deflection for simply supported beams – Deflections due to creep effect – calculation of long term deflection.

**UNIT- V COMPOSITE PRESTRESSED CONCRETE BEAMS**

**(09)**

Types of composite construction – Transformation of composite sections – flexural analysis of composite simply supported beams – calculation of stresses – Differential Shrinkage.

Limit state design criteria – partial prestressing – Non- prestressed reinforcements.

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs**

**Text Books**

1. Sinha. N.C and Roy.S.K., "**Fundamentals of prestressed concrete**" S.Chand and Co Ltd 2011.
2. Krishnaraju.N., "**Prestressed concrete**", Tata McGraw Hill Publishing company Ltd., New Delhi, 2008.

**Reference Books**

1. Lin .T.Y., and Ned H. Burns., "**Design of prestressed concrete structures**", John Wiley & Sons, International Edition, New York, 1995.
2. Dayaratnam.P., "**Prestressed Concrete Structures**" , Oxford and IBH Publishing Company pvt, Ltd, New Delhi, 2008.
3. N. Rajagopalan "**Prestressed Concrete**", Narosana Publications,2006.
4. Guyon, Y. "**Limit State Design of Prestressed Concrete Vols. I & II**", Applied Science Publishers, London, 1974.

**12C704 DESIGN AND DRAWING – II**  
(CONCRETE AND STEEL)

L T P C  
2 0 3 4

**PART A**

(25)

Detailed design and drawing of the following concrete structures:

1. Typical building floors consisting of beam and slab using BIS code.
2. Flat slab design as per BIS code
3. Isolated footings and combined footings (Rectangular, Trapezoidal)
4. Cantilever and Counterfort retaining walls.
5. Under ground water tanks.
6. Elevated water tanks.

**PART B**

(25)

Detailed design and drawing of the following Steel structures:

1. Columns with base plate
2. Design of Gantry Girder
3. Welded plate girder
4. Over head water tanks.
5. Simple trusses with connections.
6. Industrial building with gable frame, knee joint etc

**LECTURE: 20 DRAWING: 30 TOTAL: 50hrs**

**QUESTION PAPER PATTERN:**

Question paper shall consist of two questions from each part. Part A consists of 60 marks and Part B consists of 40 marks and the students have to answer one question from each part.

**Text Books**

1. Ramamurtham and Narayanan, "**Reinforced concrete structures**", Dhanpat Rai publishers, 2009.
2. Duggal .S.K, "**Design of steel structures**", Tata McGraw –Hill Publishing company Ltd, 2009
3. N.KrishnaRaju., "**Structural Design and Drawing**", University Press,2005.

**Reference Books**

1. Ramchandra, "**Limit State Design**", Standard Book House, Delhi-6, 2005.
2. Ramchandra, "**Design of Steel Structures**", Standard Book House, Delhi-6, 2004.
3. Sinha.S.N, "**Reinforced Concrete Design**", Tata McGraw Hill publishing company Ltd., 2005.
4. Krishna Raju, N and Pranesh, R.N., "**Reinforced Concrete Design – IS 456 – 2000 Principles and Practice**", New Age International Publishers, New Delhi, 2003.

## 12C6E0 CONSTRUCTION MANAGEMENT

L T P C

3 0 0 3

(09)

### UNIT – I BASIC CONCEPTS IN MANAGEMENT

Principles of Management – Functions of Management – Types of organisation – Types of Business Operations – Sole proprietorship – Partnership – Company, Public and private sector enterprises – joint Ventures – Collaborations – Bank Accounts Cheques – Operations.

### UNIT – II CONSTRUCTION PLANNING AND SCHEDULING

(09)

Development of construction plans – Defining work tasks and their relationship – Estimating activity duration and resource requirements – Work Breakdown Structure – coding systems. Relevance of Construction schedules – Bar charts – The Critical Path Method – float calculations – PERT – Scheduling with uncertain duration – Precedence Network Analysis – Crashing and Time/cost trade-offs.

### UNIT – III MATERIALS AND EQUIPMENT MANAGEMENT

(09)

Planning – Identification, Procurement and Inventory Control – Resource Allocation, Resource Leveling – Linear Programming – Transportation Problem – System approach in resource management – ABC analysis, VED analysis, FSN analysis, Vendor rating evaluation, Buying versus leasing of equipment.

### UNIT – IV HUMAN RESOURCE MANAGEMENT

(09)

Scope and objectives of HRM – Manpower policy and planning – Recruitment and selection – Training Performance appraisal – Wage Policy and Compensation systems – Company union relationship and collective bargaining – Accidents – Absenteeism and Labour Turn over – Grievances/Conflicts – Identification and resolution.

### UNIT – V COST CONTROL AND SOFTWARE APPLICATIONS

(09)

The cost control problem – The Project Budget – Forecasting for Activity cost Control – Financial accounting systems and cost accounts – Control of project cash flows – Schedule control – Schedule and Budget updates – Relating cost and schedule information – Software applications – Project Management Software – Planning, Scheduling and Resource analysis – Recording and operations – Project accounting, costing and finance.

**LECTURE: 45 TOTAL: 45hrs**

#### Text Books

1. Chitkara, K.K., "Construction Project Management Planning, Scheduling and Controlling", Tata McGraw Hill Publishing Company Ltd., 2006.
2. B Sengupta H Guha " Construction Management and Planning", Tata McGraw Hill Company Ltd., 2003.
3. Sangareddi P L Meiyappan , "Construction Management", Kumaran Publications, Coimbatore.

**Reference Books**

1. Moder. J., C.Philips and Davis, "*Project management with CPM, PERT and Precedence Diagramming*, Van Nostrand Reinhold Company, 2001.
2. Clifford F. Gray and Erik W, Larson, "*Project management-The Managerial Process*", Tata McGraw Hill Company Ltd., 2008.
3. Momoria, "*Personnel Management*", Himalaya Publishing Company, 2000.

12C6E1 RAILWAY ENGINEERING

L T P C

3 0 0 3

**UNIT – I INTRODUCTION TO RAILWAY PLANNING AND RAIL ELEMENTS**

(9)

Historical development of Indian railways-Route alignment surveys, modern methods – Elements of permanent way – Rails, sleepers, ballast, rail fixtures and fastenings, coning of wheels, creep in rails, defects in rails.

**UNIT – II RAILWAY GEOMETRIC DESIGN**

(9)

Geometric design of railway track, gradient, super elevation, widening of gauge on curves

**UNIT – III RAILWAY STATION YARDS AND OPERATIONS**

(9)

Planning and development of railway station yards, –Turnouts, points and crossings – Signalling - Interlocking, track circuiting – Modern developments in railways, urban railways, underground and tube railways–Basic planning for MRTS and Suburban railways–Electric traction.

**UNIT – IV RAILWAY CONSTRUCTION AND MAINTENANCE**

(9)

Earthwork – Stabilization of track on poor soil- Tunneling - Methods, drainage and ventilation – Construction and maintenance of tracks – uniguage – Maintenance of rolling stocks.

**UNIT – V SIGNALLING AND INTERLOCKING**

(9)

Signaling and Interlocking – Automatic signals – Electric circuiting- modern signals, maintenance of signals.

**LECTURE : 45 TOTAL : 45hrs**

**Text Books**

1. Saxena Subhash, C. and Satyapal Arora, *A Course in Railway Engineering*, Dhanpat Rai and Sons, Delhi, 1998
2. Rangwala.P.S, *Railway Engineering*, Charotar Publishing House, 1995

**Reference Books**

1. Vazirani.V.N. and Chandola.S.P., *Transportation Engineering-Vol.1*, Khanna Technical Publications, New Delhi 1991
2. Agarwal.M.M., *Indian Railway Track*, New Delhi.



12C6E2 SMART MATERIALS AND SMART STRUCTURES

L T P C

3 0 0 3

(09)

UNIT-I INTRODUCTION

Introduction to Smart Materials and Structures - Instrumented structures functions and response - Sensing systems - Self diagnosis - Signal processing consideration - Actuation systems and effectors.

(09)

UNIT-II MEASURING TECHNIQUES

Strain Measuring Techniques using Electrical strain gauges, Types - Resistance - Capacitance - Inductance Wheatstone bridges - Pressure transducers - Load cells - Temperature Compensation - Strain Rosettes.

(09)

UNIT-III SENSORS

Sensing Technology - Types of Sensors - Physical Measurement using Piezo Electric Strain measurement - Inductively Read Transducers - The LVDT - Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment - Absorptive chemical sensors - Spectroscopes - Fibre Optic Chemical Sensing Systems and Distributed measurement.

(09)

UNIT-IV ACTUATORS

Actuator Techniques - Actuator and actuator materials - Piezoelectric and Electrostrictive Material - Magnetostructure Material - Shape Memory Alloys-Electro-rheological Fluids- Electro magnetic actuation - Role of actuators and Actuator Materials.

(09)

UNIT-V SIGNAL PROCESSING AND CONTROL SYSTEMS

Data Acquisition and Processing - Signal Processing and Control for Smart Structures - Sensors as Geometrical Processors - Signal Processing - Control System - Linear and Non-Linear.

LECTURE: 45 TOTAL: 45hrs

**Text Books**

1. Brain Culshaw, "Smart Structure and Materials", Artech House - Borton. London, 2003..
2. Srinivasan, A.V. and Michael McFarland, D., "Smart Structures: Analysis and Design", Cambridge University Press, 2010.
3. Yoseph Bar Cohen, "Smart Structures and Materials", The International Society for Optical Engineering 2003.

**Reference Books**

1. L. S. Srinath, "Experimental Stress Analysis", Tata McGraw Hill, 2004.
2. J. W. Dally & W. F. Riley, "Experimental Stress Analysis", Tata McGraw Hill Company.

**12C6E3 MAINTENANCE AND REHABILITATION OF STRUCTURES**

**L T P C**

**3 0 0 3**

**UNIT I - MAINTENANCE AND REPAIR STRATEGIES**

**(09)**

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration, Diagnosis of causes and preventive measures.

**UNIT II - SERVICEABILITY AND DURABILITY OF CONCRETE**

**(09)**

Quality assurance for concrete construction concrete properties – strength, permeability, thermal properties and cracking. – Effects due to climate, temperature, chemicals, corrosion – design and construction errors – Effects of cover thickness and cracking.

**UNIT III- SPECIAL MATERIALS FOR REPAIR**

**(09)**

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

**UNIT IV- TECHNIQUES FOR REPAIR AND DEMOLITION**

**(09)**

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, coating and cathodic protection. Engineered demolition techniques for Dilapidated structures – case studies.

**UNIT V- REPAIRS, REHABILITATION & STRENGTHENING OF STRUCTURES**

**(09)**

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure. Strengthening of Super Structures – plating - Conversion to composite construction - post stressing - Jacketing - Reinforcement addition, strengthening the substructures - Increasing the load capacity of footing.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Denison Campbell, Allen and Harold Roper, *Concrete Structures, Materials, Maintenance and Repair*, Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, *Repair of Concrete structures*, Blakie and Sons, UK, 1987
3. Johnson,S.M., "Deterioration, Maintenance and repair of Structures", McGraw-Hill Book Company, Newyork, 1965.

**Reference Books**

1. M.S.Shetty, *Concrete Technology – Theory and Practice*, S.Chand and Company, New Delhi, 1992.
2. M.L. Gambhir, *Concrete Technology*, Tata Mc-Graw Hill Company, Noida, 2011.
3. Santhakumar, A.R., *Training Course notes on Damage Assessment and repairs in Low Cost Housing, "RHDC – NBO" Anna University, July 1992.*
4. Lakshmipathy, M. etal. *Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 -30<sup>th</sup> October 1999*

**12C6E4 SAFETY IN CIVIL ENGINEERING PRACTICES**

**L T P C**  
**3 0 0 3**

**UNIT I PRE-CONSTRUCTION CONSIDERATIONS**

**(9)**

Planning and scheduling , Housekeeping and on-site safety ,Basic checklist , Asbestos removal Electrical power lines, Overhead high-voltage electricity Overhead low-voltage electricity, Underground electrical hazards.

**UNIT II CONSTRUCTION**

**(9)**

Basic personal protective equipment and clothing -Foot protection ,Head protection Hearing protection- Trenches and excavations- General requirements, Sloping and shoring requirements Additional excavation requirements.

**UNIT III FORMWORK AND POURING**

**(9)**

Formwork , Concrete pouring and pumping - General framing - Guardrails and floor openings, Floor and roof openings, Lifting walls, Fall protection, Selecting fall protection Planning for fall protection on your project Fall protection plan

**UNIT IV TRUSSES AND ROOF WORK**

**(9)**

Trusses- Instruction for truss installers , Truss erection Roof work -Roof jacks and toe-holds(slide guards) Scaffolds Guardrails for scaffolds Toeboards for scaffolds -Wood scaffold erection guidelines -Design and erection requirements for job-constructed wood scaffolds Scaffold planks -Other types of scaffolds ,Ladder-jack scaffolds Trestle scaffolds ,Shore and lean-to scaffolds - Rolling scaffolds

**UNIT V EQUIPMENT SAFETY**

**(9)**

Ladders Requirements for safe ladder use , Job-built ladders, Stepladders Safe Work Practices for House Construction, Electrical power tools and cords Safe work procedures ,Hand tool ergonomics Factors affecting tool use ,Reducing risk of injury Compressed air for cleaning Pneumatic nailing and stapling equipment, Safe work procedures, Power tools—saws Basic safety Kickback , Construction site hazards

**LECTURE : 45 TOTAL: 45hrs**

**Text Books**

1. Allen St.John Hot , "Principles of Construction Safety" John Wiley & Sons (2005)
2. Mark Mc.Guire Moran "Construction Safety Hand Book" (1996)

**Reference Books**

1. Grimaldi Simonds "Safety Management " AITBS Publishers ,New Delhi (2001)
2. V.J.Davies .K.Tomasin " Construction Safety Handbook" (1996)

**12C7E0 FINITE ELEMENT METHOD**

**L T P C**

**3 0 0 3**

**(09)**

**UNIT- I ELEMENTS OF ELASTICITY**

Basic principles of structural mechanics – Equations of equilibrium – Strain displacement relations – Stress strain relations – Plane stress and plane strain cases – Principles of Virtual work and minimum potential energy.

**UNIT- II DIRECT STIFFNESS METHOD**

**(09)**

Steps in direct method of FEA – Element stiffness matrix – Global stiffness matrix – Boundary conditions – Problems on simple beams and Trusses.

**UNIT- III FINITE ELEMENTS**

**(09)**

Discretization - Basic element shapes - Element properties – Node numbering procedure – Convergence requirements – Generalised co-ordinates – Natural co-ordinates – Shape functions for linear & quadratic models – Stiffness matrix – Nodal load vector – Static condensation – Simple problems.

**UNIT- IV INTRODUCTION TO ISOPARAMETRIC ELEMENTS**

**(09)**

Concept of sub, iso, super parametric elements – Gauss quadrature – Examples in one and two dimensional elements.

**UNIT- V SOLUTION TECHNIQUES**

**(09)**

Different solvers – Variational approach – Weighted mean residual methods like Collocation method, Subdomain method, Galerkin method and Least square method – Simple problems only

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Krishnamoorthy C.S., "Finite Element Analysis- Theory and Programming", Second Edition, Tata McGraw Hill Publishing Co., 2004.
2. Tirupathi R. Chandrupatla and Ashok D. Belugundu, "Introduction to Finite Elements in Engineering", Third Edition, Prentice Hall India Pvt Ltd, 2011.
3. P.Seshu, "Textbook of Finite Element Analysis", Prentice Hall India Pvt Ltd, 2008.

**Reference Books**

1. Cook Robert. D, "Concepts and Applications of Finite Element Analysis", John Wiley and Sons, INC 1995.
2. Rajasekaran.S., "Finite Element Analysis in Engineering Design", Wheeler Publishing, 2000.
3. S.S.Rao, "The Finite Element Method in Engineering", Buttersworth-Heinemann publishing, 2000.

**12C7E1 ADVANCED CONCRETE DESIGN**

**L T P C**

**3 0 0 3**

**UNIT- I YIELD LINE THEORY OF SLABS AND INELASTIC BEHAVIOUR OF CONCRETE BEAMS**

**(09)**

Yield line theory- Assumptions made in analysis – analysis of isotropically and orthotropically reinforced slabs for various shapes and different edge conditions by virtual work method and equilibrium method – design by limit state method. Inelastic behaviour of concrete beams, moment rotation curves, moment redistribution

**UNIT- II DESIGN OF SPECIAL RC ELEMENTS**

**(09)**

Design of slender columns – concrete confined by reinforcement – provision for ties in reinforced concrete slab – frame system – Design of cast-in-situ joints in frames – design of RC walls – ordinary and shear walls – design of corbels.

**UNIT- III GRID FLOORS AND RIBBED SLABS**

**(09)**

Grid floors – design principles – analysis of grid floor by approximate method – detailing of steel in flat grids. Ribbed slabs – specifications – analysis of slab for moment and shear – deflection – Design – arrangement of reinforcement – deep beams.

**UNIT- IV BUNKERS AND SILOS**

**(09)**

Design of Bunkers – Design of Silo- Detailing.

**UNIT-V SPECIAL TOPICS**

**(09)**

Types of bridges – IRC loadings – Design of single span slab bridge deck for class A loading – Design of the deck of T – beam and slab bridge for class AA loading.

Design of Corbels – Deep beams.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Varghese.P.C., "*Advanced Reinforced concrete design*", Prentice – Hall of India Private Ltd, NewDelhi, 2007..
2. Krishna ráju, "*Advanced reinforced concrete design – S.I units*", C.B.S., New Delhi, 2006.

**Reference Books**

1. Purushothaman, P., *"Reinforced concrete structural Elements"*, Tata McGraw Hill, New Delhi, 2002..
2. Ashok. K. Jain., *"Reinforced concrete- Limit state design"*, NemChand Bros, Roorkee, 2000.
3. Sinha. S.N., *"Reinforced Concrete Design"*, Tata McGraw Hill, New Delhi, 2003.
4. Syal I.C. and Goel A.K., *"Reinforced Concrete Structures"*, A.H. Wheeler & Co., 2004.
5. IS 456-2000, *"Indian standard code of practice for plain and reinforced concrete"*, Bureau of Indian standards, New Delhi, 2000.
6. SP 34(1987), *"Handbook on Concrete Reinforcement and Detailing"*, BIS, New Delhi

**12C7E2 BASICS OF DYNAMICS AND ASEISMIC DESIGN OF STRUCTURES**

**L T P C**

**3 0 0 3**

**(09)**

**UNIT – I THEORY OF VIBRATIONS**

Concept of inertia and damping – Types of damping – Difference between static forces and dynamic excitation – degrees of freedom – SDOF idealization – Equations of motion of SDOF system of mass as well as base excitation – Free vibration of SDOF system – response to harmonic excitation – Impulse and response to unit impulse – Duhamel integral.

**(09)**

**UNIT – II MULTIPLE DEGREE OF FREEDOM SYSTEM**

Two degree of freedom system – Normal modes of vibration – Natural frequencies – Mode shapes – Introduction to MODF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations)

**(10)**

**UNIT – III ELEMENTS OF SEISMOLOGY AND SEISMIC DESIGN CONCEPT**

Causes of earthquake – Geological faults – tectonic plate theory – Elastic rebound – Epicentre – Hypocentre – primary, shear and Raleigh waves – seismogram – magnitude and intensity of earthquake – magnitude and intensity scales – Spectral acceleration – Information on some disastrous earthquakes – concept of earthquake resistant design – strong column weak beam concept – guide lines for seismic resistant construction – effects of structural irregularities – seismo resistant building architecture.

**(09)**

**UNIT – IV RESPONSE OF STRUCTURES TO EARTHQUAKES**

Response and design spectra – Design earthquake – concept of peak acceleration – Site specific response spectrum – Effect of soil properties and damping – Liquefaction of soils – Importance of ductility – Methods of introducing ductility into RC structures.

**(08)**

**UNIT – V DESIGN METHODOLOGY**

IS 1893, IS 13920 and IS 4326 – Codal provisions – design as per the codes – Base isolation techniques – Vibration control measures – Important points in mitigating effects of earthquakes on structures.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Chopra, A.K., "Dynamics of structures – Theory and Applications to Earthquake Engineering", Second Edition, Pearson Education, 2005.
2. David Key, " Earthquake design practice for building ", Thomas Telford, London NPEEE Publications.
3. Pankaj Agarwal and Manish ShriKhande, "Earthquake Resistant Design of Structures", Prentice- Hall of India, 2007, New Delhi



**Reference Books**

1. Arya, A.S., ed., "**Earthquake engineering**", Jai Krishna 60<sup>th</sup> Birthday Anniversary commemoration volume, ISET, Sarita prakashan, Meerut, 1974.
2. Biggs, J.M., "**Introduction to Structural Dynamics**", McGraw – Hill Book Co., Ny., 1964.
3. Dowrick, D.J., "**Earthquake Resistant Design**", John Wiley & sons, London, 1977.
4. Paz, M., "**Structural Dynamics – Theory & Computation**", CSB Publishers & Distributors, Shahdara, Delhi, 1985.

12C7E3 PAVEMENT ENGINEERING

L T P C

3 0 0 3

UNIT – I BASIC CONCEPTS

(09)

Objects and Requirements of Pavements – Pavement types – Functions and characteristics of pavement – Approaches to Pavement design – Design factors considered in design of Pavements – Design wheel load – Maximum wheel load – contact pressure – ESWL – Repetition of loads – Stresses and deflections in layered systems.

UNIT – II FLEXIBLE PAVEMENT

(09)

Design of flexible pavement by group index – CBR – California R value – Triaxial McLeod and Burmister – IRC design guidelines.

UNIT – III RIGID PAVEMENT

(09)

Design – General design considerations – Westerguard's equation for wheel loads – Evaluation of wheel load stresses – Temperature stresses – Design of joints – IRC design guidelines – Airfield pavements – design principles.

UNIT – IV QUALITY CONTROL

(09)

Field compaction – Rammers – Rollers – Compaction control – Insitu density – Pavement materials – Bitumen – Ductility – Viscosity – Binder content and Softening point Tests – Aggregate – Crushing – Abrasion – Impact Tests – Water absorption – Flakiness and Elongation indices.

UNIT – V EVALUATION AND REHABILITATION

(09)

Need for highway maintenance – classification of maintenance works – maintenance management system – Pavement failures – causes and Types – importance of highway drainage – Pavement evaluation and rehabilitation – condition and evaluation surveys – serviceability index of rural roads – Strengthening of existing pavements – overlay design.

LECTURE: 45 TOTAL: 45hrs

**Text Books**

1. Yoder, R.J and Witchak, M.W "Principles of Pavement Design", John wiley, 2000.
2. Khanna, S.K and Justo C.E.G "Highway Engineering", New Chand and Brothers, Roorkee, 2002.

**Reference Books**

1. Kadiyali, L.R., "Transport planning & Traffic Engineering" Khanna Publishers, 2003.
2. Wright, P.H "Highway Engineers", Johnwiley& Sons, Inc, New York, 1996.
3. Design and specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001.
4. Guidelines for the Design of Flexile Pavements, IRC : 37-2001, The Indian roads congress, New Delhi.
5. Guidelines for the Design of Rigid Pavements for Highways, IRC : 58-1998, The Indian Roads Congress, New Delhi.
6. O'Flaherry, C.A – Highway Engineering Vol 2, Edward Arnold Cp. 1978.

**12C7E4 TOWN PLANNING AND ARCHITECTURE**

**L T P C**  
**3 0 0 3**

**UNIT I : TOWN PLANNING**

**(9)**

History of evolution of towns - Town and environment - Climate, humidity, wind and radiation - Surveys and Data collection - Residential neighbourhoods - Industrial areas - Public Buildings - Housing and Slum clearance.

**UNIT II : BUILDING RULES AND GUIDELINES**

**(9)**

General - Zoning regulations - Regulations regarding layouts or subdivisions - Building regulations - Rules for special types of buildings - Floor space index - minimum plot size and building front age - Open spaces - Minimum standard dimensions of building elements - Provision for lighting and ventilation - Provision for means of access.

**UNIT III : BASIC ELEMENTS OF ARCHITECTURE**

**(9)**

Introduction of Architecture - Definition - Mass and space visual emotional effects of geometric forms and their derivatives - The sphere, the cube, the pyramid, the cylinder and cone - The aesthetic qualities of Architecture - Proportion, scale, balance, symmetry, rhythm and axis - contrast in form - Harmony.

**UNIT IV : PRINCIPLES OF ORIENTATION AND PLANNING OF BUILDINGS**

**(9)**

General - factors affecting orientation - sun - Wind - Rain - Orientation criteria for Indian conditions - Principles governing the theory of Planning - Planning of Residential buildings.

**UNIT V : ELEMENTS OF INTERIOR DESIGN**

**(9)**

General - Decorative Materials - Cement Bonded Board (BISON PANEL), Water proof cement paint, Industrial glazing and Roofing, unit masonry, plaster and dry wall, Wall surface materials, Effect of colour on architecture - Home furnishing - plans in rooms.

**LECTURE: 45 TOTAL: 45hrs**

**Text Book**

1. S.C.Rangwala, "Elements of Town Planning", Mc Graw Hill, London, 2006.

**Reference Books**

1. V.S.Pramar, 'Design fundamentals and architecture' Lakshmi Publishers, 2003.
2. Hiraskar, "fundamentals in town planning" Khanna Publishers, 2005.

## 12C7E5 INDUSTRIAL WASTEWATER MANAGEMENT

L T P C

3 0 0 3

### UNIT-I INTRODUCTION

(09)

Effects of Industrial Wastes on Streams, Land and wastewater Treatment Plants – water quality criteria – Effluent standards – Industrial effluent - volume reduction – Strength reduction – Process Modification - Methods and Materials changes - Housekeeping – established recovery and reuse methods for byproducts within the plant operations – Regularity requirements and Environmental legislations.

### UNIT- II INDUSTRIAL EFFLUENT TREATMENT

(09)

Equalization and Neutralization – separation of Solids - Physio-chemical treatment – Removal of organic and inorganic solids – combined treatment of Industrial and municipal Wastes - Individual and Common Effluent Treatment Plants.

Biological treatment methods – Aerobic and Anaerobic digestion – Ultimate disposal of sludge – Cleaner Technologies and pollution prevention – Waste minimization – Management of RO rejects.

### UNIT- III ADVANCED WASTEWATER TREATMENT, REUSE AND RESIDUE MANAGEMENT

(09)

Chemical Oxidation - Ozonation - Photocatalysis - Wet Air Oxidation - Evaporation - Ion exchange - Membrane technologies - Nutrient removal - Land treatment – Well injection. Quantification and characteristics of sludge - thickening, Digestion, Wet combustion - Conditioning, Dewatering and Disposal of Sludge.

### UNIT- IV CASE STUDIES – 1

(09)

Industrial manufacturing process description, wastewater characteristics and effluent treatment flow sheet for Textiles, Sugar mill, distilleries, Thermal power plant, Nuclear power plant, Petroleum refineries, Fertilizers and Dairy.

### UNIT-V CASE STUDIES – 2

(09)

Industrial manufacturing process description, wastewater characteristics and effluent treatment flow sheet for Tanneries, Pulp and Paper mill, Chemical industries, Metal finishing industries, Iron and Steel industries, Meat packing industries and Poultry plant - Industrial estates and Industrial Clusters.

LECTURE: 45 TOTAL: 45hrs

**Text Books**

1. *M. Narayana Rao and Amal K. Dutta, "Wastewater Treatment", Oxford & IBH Publishing Co., Pvt. Ltd., New Delhi, 2001.*
2. *D. Barnes, P. J. Buss and B. W. Gould, "Water and Wastewater Systems", Pitman Publishing Inc., Marshfield, 2000.*

**Reference Books**

1. *Nemerow N. L., "Industrial Water Pollution", Addison - Wesley Publishing Company Inc., USA, 1978.*
2. *Wesley Eckenfelder Jr. W, "Industrial water pollution control", McGraw Hill book Co, New Delhi, 2001.*
3. *Mahajan S. P. "Pollution Control in process industries", Tata McGraw Hill Publishing Co Ltd., New Delhi, 1989.*
4. *"Pollution Prevention and Abatement Handbook Towards Cleaner Production" - The World Bank Group, Washington, D. C., 1998.*

12C7E6 OPERATIONS RESEARCH

L T P C

3 0 0 3

UNIT I LINEAR MODEL

(10)

The phases of OR study – formation of an L.P model- graphical solution – simplex algorithm – artificial variables technique– Big M method, two phase method, Duality in LPP. Transportation problems- VAM – MODI technique, Assignment problems.

UNIT II NETWORK MODELS

(8)

Shortest route – minimal spanning tree - maximum flow models – project network- CPM and PERT network-critical path scheduling.

UNIT III INVENTORY MODEL

(9)

Types of Inventory- EOQ –ERL- Deterministic inventory problems – Price breaks - Stochastic inventory problems-selective inventory control techniques.

UNIT IV REPLACEMENT MODELS

(9)

Replacement of items that deteriorate with time – value of money changing with time – not charging with time – optimum replacement policy – individual and group replacement. Sequencing problem: models with n jobs with 2 machines – problem with jobs with m machines.

UNIT V QUEUING THEORY

(9)

Queuing models – queuing systems and structures – notation –parameter – single server and multiserver models – Poisson input – exponential service – constant rate service – infinite population.

LECTURE: 45 TOTAL: 45hrs

Text Books

1. Wayne.L.Winston, *Operations research applications and algorithms*, Thomson learning, 4th edition 2007.
2. Taha H.A, "Operation Research", Pearson Education sixth edition, 2003

Reference Books

1. Frederick.S.Hiller and Gerald.J.Lieberman, "Operations research concepts and cases", TMH (SIE) 8th edition.
2. J.K.Sharma, "Operations research theory and applications", Macmillan India .3rd edition 2007,
3. Hira and Gupta " Problems in Operations Research", S.Chand and Co,2002.
4. Panneerselvam, "Operations Research" Prentice Hall of India, 2003.
5. G Srinivasan, "Operations research principles and applications", PHI (EEE) 2007.
6. Wagner, "Operations Research", Prentice Hall of India, 2000.

## 12C7E7 PROFESSIONAL ETHICS

(Common with ECE)

L T P C

3 0 0 3 ✓

### UNIT-I ENGINEERING ETHICS

(09)

Senses of Engineering ethics – Variety of moral issues – Types of inquiry- Moral dilemmas. Moral autonomy – Kolberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideals and virtues – theories about right action – self interest – customs and religion – use of ethical theories.

### UNIT-II ENGINEERING AS SOCIAL EXPERIMENTATION

(09)

Engineering as social experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – Case studies

### UNIT-III ENGINEERS RESPONSIBILITY FOR SAFETY

(09)

Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk – Case studies

### UNIT-IV RESPONSIBILITIES AND RIGHTS

(09)

Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee right – discrimination – intellectual property rights, Case studies

### UNIT-V GLOBAL ISSUE

(09)

Multinational corporations – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – sample code of conduct, Case studies

LECTURE: 45 TOTAL: 45hrs

#### Text Books

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw hill, New York, 2004.
2. Charles d Fleederman, "Engineering Ethics" prentice hall, New Mexico, 2003.
3. Charles e Harris, J.R. Micheal S. Pritchard, Micheal J. Rabins, "Engineering Ethics" Second Edition Thomson Wadsworth, 2000.

#### Reference Books

1. Laura Schlesinger, "How Could You Do That The Abdication of Character, Courage and Conscience" Harper Collins, New York, 1996.
2. Stephen Carter, "Integrity Basic book", New York, 1996.
3. Tom Rusk "The Power of Ethical Persuasion : From Conflict to Partnership at Work and In Private Life" Viking, New York, 1993.
4. Govindarajan. M, Natarajan. S, Senthilkumar. V.S, "Engineering Ethics" Prentice Hall, New Delhi, 2004.

12C7E8 AIRPORT DOCKS AND HARBOUR ENGINEERING

L T P C

3 0 0 3

UNIT- I AIRPORTS

(09)

Air transport-development in India and important in national transportation sector-airport planning and site selection-landing and terminal areas – layout of their components and locational requirements- airport classification- design standards of airports.

UNIT- II AIRPORT COMPONENTS AND DRAINAGE

(11)

Runways – Orientation – types, pattern layout- basic runway length-runway design – orientation, geometric design and corrections- Taxiways and apron - general principles of design, layout, construction and maintenance terminal area- terminal buildings, hangers and auxiliary structures. Airport drainage- various types, materials and construction features- airport marking and lighting.

UNIT- III DOCKS AND HARBOURS

(10)

Historical development of docks ,harbours and seaports- Basic definition - Requirements and classification- recent trends in seaport planning and construction including container and special purpose terminals- inland water transport. Types of wet and dry docks- their functional design and usage.

UNIT- IV BREAK WATER AND QUAYS

(07)

Types, uses and general construction methods of break water- layout and construction of quays and jetties and Wharves.

UNIT-V NAVIGATIONAL AIDS AND DREDGING

(08)

Necessity and types of signals including floating signals – buoys and beacons- mooring and mooring accessories - Types of dredging and its application – Cargo handling.

LECTURE: 45 TOTAL: 45hrs

**Text Books**

1. Khanna.S K and Arora.M.G., "Airport planning and design", S.Chand and bros, 2006.
2. Vazirani.V.N and Chandola.S.P., "Transportation and Engineering" vol.2 Khanna publishers, New Delhi, 2005.

**Reference Books**

1. Shahani .P.B, "Airport techniques", second edition- Oxford publishing, NewDelhi, 1990.
2. Srinivasan.R., "Harbour, Dock and Tunnel Engineering", Chartor publishing house, Anand, India ,2004.



12C7E9 HYDROLOGY

L T P C

3 0 0 3

(09)

**UNIT- I HYDROMETEOROLOGY**

Hydrological cycle – Hydrometeorological factors – Cloud formation – Winds and their movement – Types of precipitation – Forms of precipitation – Density and Adequacy of rain gauges – Recording and non - recording rain gauges – Optimum number of rain gauges.

**UNIT – II PRECIPITATION AND ABSTRACTIONS**

(09)

Spatial distribution – Consistency analysis – Frequency analysis – Intensity, duration, frequency relationships – Evaporation – Infiltration – Horton's equation – Infiltration indices – measurement of infiltration – abstraction loss.

**UNIT – III HYDROGRAPH ANALYSIS**

(09)

Flood Hydrograph – Components of flood hydrograph – Factors affecting shape of Hydrograph - Base flow separation – Unit hydrograph – Advantages – Instantaneous Unit hydrograph - S curve Hydrograph - Synthetic unit hydrograph – Applications.

**UNIT – IV GROUND WATER HYDROLOGY**

(09)

Occurrence of ground water – Types of aquifer – Dupuit's assumptions – Darcy's law – Estimation of aquifer parameters – Pump tests – steady state discharge in a Confined and Unconfined Aquifers – Leaky aquifer – well loss – aquifer loss – problems.

**UNIT – V FLOOD ANALYSIS**

(09)

Flood estimation – Gumbel's method – Log Pearson type III method – Reservoir flood routing – Channel routing – Types of streams – Stage discharge relationships - Flow measurements – Current meter method for velocity measurements.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Santosh Kumar Garg, "Hydrology and Water Resources Engineering", Khanna Publications Pvt.Ltd. New Delhi, 2009.
2. Jayaramy Reddy. P., "Hydrology", Tata McGraw-Hill Publications Pvt.Ltd, New Delhi, 2003.

**Reference Books**

1. Subramanya. K., "Engineering Hydrology", Tata McGraw-Hill Publications Pvt.Ltd, New Delhi, 2002.
2. Warren Viessman and Gary L.Lewis, "Introduction to Hydrology", Prentice Hall of India Pvt.Ltd, New Delhi, 2003.

**12C8E0 EXPERIMENTAL STRESS ANALYSIS**

**L T P C**

**3 0 0 3**

**(09)**

**UNIT - I STRAIN MEASUREMENT METHODS**

Strain gauges – basic characteristics – mechanical, optical, acoustic, electrical inductance and capacitance, pneumatic types – description and working principles – factors producing strain sensitivity – Gauge construction – temperature compensation – Gauge sensitivities and gauge factors – Strain rosettes – Calculation of principal strains and principal stresses.

**(09)**

**UNIT – II MEASURING INSTRUMENTS**

Linear Variable Differential Transducer – Cathode Ray Oscilloscope – XY Plotter – Digital Data Acquisition System – Hydraulic Jacks – Pressure Jacks – load cells – Proving Rings – Vibration meter – Wind Tunnel – Calibration of Testing Instruments.

**(09)**

**UNIT - III PHOTO ELASTICITY**

Two dimensional photo elasticity – Stress optic law – Polariscope – isoclinic and isochromatic fringes – compensators – Separation techniques – Model materials – Calibration of photo elastic materials.

**(09)**

**UNIT - IV MODEL ANALYSIS**

Model analysis – Direct and Indirect models – laws of structural similitude – choice of scales – Model materials – Limitations of model studies – Buckingham pi theorem – Design of direct and indirect models – Begg's Deformeter and its applications.

**(09)**

**UNIT-V ADVANCED TECHNIQUES**

Fundamentals of photo elastic coatings – Morie fringe and Brittle coating technique – crack detection techniques – Introduction to stress freezing technique. – Introduction to nondestructive testings - Holography

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Dally and Railey, "Experimental stress analysis", 2003.
2. Richard G Budynas, "Advanced Strength and Applied Stress Analysis", Tata McGraw Hill Publishing company Ltd., New Delhi, 2011

**Reference Books**

1. Sadhu Singh, "Experimental stress analysis", Khanna Publishers, New Delhi, 2005.
2. Dove and Adam, "Experimental stress analysis and Motion measurements", 1989
3. L.S.Srinath. 'Experimental stress Analysis', Tata McGraw Hill company Book Ltd., NewDelhi, 1984
4. Bray and Stanley, Non Destructive Evaluation, McGraw Hill Publishing co., New York, 1989

**12C8E1 FUNDAMENTALS OF REMOTE SENSING AND GIS APPLICATIONS**

**L T P C**

**3 0 0 3**

**(09)**

**UNIT - I PRINCIPLES OF REMOTE SENSING**

Definition – Historical background – Basic principles and methods of remote sensing – Electromagnetic radiation and source – Electromagnetic spectrum – Wave and particle theory – energy equations – Interference - Atmospheric effects on remote sensing – Atmospheric windows – Energy interaction with surface features – Reflectance – Specular and diffuse reflection surfaces – Spectral signatures – Spectral signature curves – Thermal and microwave.

**(09)**

**UNIT – II REMOTE SENSING DATA ACQUISITION**

Data acquisition – Active and passive remote sensing – Platforms – Aerial and space platforms – Aircraft and satellites – Synoptivity and Repetivity – Sensors – Aerial camera – Non-photographic optical sensors – Multispectral scanners – Thermal scanners, Imaging radars – SLAR and SAR LIDAR.

**(09)**

**UNIT – III SATELLITE REMOTE SENSING AND DIGITAL IMAGE PROCESSING**

Satellites – Classification – Based on orbits – Based on purpose – Remote sensing satellites – LANDSAT, SPOT, IRS and IKONOS – Their orbital characteristics – Sensors onboard – Characteristics of thermal imagery and radar imagery – Comparison with image types – Characteristics of digital image processing – Pre-processing – Image enhancement – Filtering – Classification.

**(09)**

**UNIT - IV GEOGRAPHIC INFORMATION SYSTEM**

GIS – Components of GIS – Hardware, Software and organizational set up – Data – Spatial and Non spatial – Maps – Types of maps – Map Projection – Types of projection – Data input – Digitization – Editing – Raster and Vector data structures – Comparison – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data output – Printers and plotters.

**(09)**

**UNIT – V SATELLITE IMAGERY AND GIS APPLICATIONS**

Application of satellite imagery – Merits – Limitations – Comparison with aerial photographs – Visual interpretation of satellite imagery – Elements of interpretation – Interpretation keys-

GPS and its Applications- Application of remote sensing and GIS in Surveying, Water resources exploration – Land use/ Land cover studies – Geology – Agriculture, Disaster Management, Coastal zone Management and Environmental Engineering

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Patel A.N and Surendra singh, "Remote Sensing Principles and applications ", Scientific Publishers, Jodhpur , 2001.
2. Anji Reddy, "Remote Sensing and Geographical Information system", BS Publications 2001.
3. M.G Srinivas (Edited by) " Remote sensing applications", Narosa publishing House, 2001.

**Reference Books**

1. Thomas M.Lille sand & Raiph W.Kiefer, "Remote sensing and Image Interpretation " John Wiley Sons, 2004.
2. Burrough P.A, Principles of GIS for land resources assessment, Oxford, 2002.

12C8E2 NON-CONVENTIONAL ENERGY SOURCES

L T P C

3 0 0 3

UNIT - I WORLD'S PRODUCTION AND RESOURCES OF ENERGY SOURCES

(09)

World energy consumption pattern, commercial energy sources, Non conventional and renewable energy sources " Study of global availability and in India - low energy building materials" Energy economy - Human development index.

UNIT - II SOLAR ENERGY

(09)

Total Energy concept and installation " solar radiation and its measurement, collecting devices. Low temperature, medium temperature collectors and their efficiencies-solar passive cooling " Design of collectors " solar energy its applications " solar cells.

UNIT - III WIND ENERGY

(09)

Wind Machines- Basic principles - types and performance- wind energy estimation " wind power and power coefficient " energy conservation and storage " batteries and battery storage, fly wheel storage, hydrogen storage and compressed air storage.

UNIT - IV BIOMASS

(09)

Energy from Biomass " resources, properties, benefits - Biomass conversion technologies " Bio gas generation " Bio gas plant - types and design " Biodiesel production -Bio-hydrogen production " Gasification - types of Gasifiers

UNIT - V OTHER ALTERNATE SOURCES

(09)

Hydro Energy conversion - Hydro power systems - Energy from ocean " Ocean Thermal Energy Conservation (OTEC) " Tidal power, geothermal energy generation " Fuel cells " Photovoltaic devices.

LECTURE: 45 TOTAL: 45hrs

Text Books

1. Mukherjee. D & Chakrabarti. S, "Fundamentals of renewable energy systems", New Age International, (P). Ltd, New Delhi 2005.
2. Rai.G.D, "Non Conventional Energy sources", Khanna Publications, 1994.

Reference Books

1. Duffie and Beckmann, "solar Energy thermal processes", John Wiley & sons.
2. B.R.Pai, M.S.Rama Prasad, "Power Generation Through Renewable Sources", Tata McGraw " Hill, Bombay, 1990.
3. Hall.D.O. and Ravindranath.N.H., Biomass, "Energy and Environment - A developing country perspective from India", Oxford University Press, Oxford, 1995.

**12C8E3 MACHINE FOUNDATION**

**L T P C**

**3 0 0 3**

**UNIT – I INTRODUCTION**

**(09)**

Types of Machine Foundation – General Requirements of Machine Foundations – Wave Propagation in an elastic homogenous medium – Rayleigh, shear and compression waves. Permissible amplitudes and Bearing Pressures

**UNIT – II VIBRATIONS OF MACHINES**

**(09)**

Theory of Vibrations – Vibration of Elementary Systems – vibratory motion – free vibration and Forced Vibration – Single degree of freedom and multi degree of freedom systems – Principles of vibration measuring instruments.

**UNIT – III DESIGN PARAMETERS**

**(09)**

Elastic Properties of soils – Coefficient of elastic uniform and non uniform compression and shear – determination of dynamic properties of soils - Standard tests. Evaluation of Design Parameters – their importance.

**UNIT – IV DESIGN OF MACHINE FOUNDATION**

**(09)**

Design Criteria-analysis of loads-design procedure for block foundations – framed type foundations –foundations for impact machines – reciprocating machines.

**UNIT – V VIBRATION ISOLATION**

**(09)**

Vibration isolation – isolation technique – construction details – isolation by location- isolation by barriers – Active and Passive isolation methods – control measures.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Prakash .S.,& Puri .V.K., "Foundations for Machines", Mcgraw Hill Publishing company 1998.
2. Srinivasalu P and Vaidhyadnan C.V., "Hand book of Machine Foundation", Tata Mcgraw Hill Publishing Ltd.,New Delhi,2007.

**Reference Books**

1. Swamisaran, "Soil Dynamics and Machine Foundations", Galgotia Publications Pvt. Ltd, 2010
2. Kameswara Rao, "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003
3. Barkan, "Dynamics of bases and foundations", McGraw Hill Book Company,1962
4. IS 2974 part 1-1982, IS 2974 part 2-1980, IS 2974 part 3-1992, IS 2974 part 4-1979, IS 2974 part5-1987.

12C8E4 GEOTECHNICAL EARTHQUAKE ENGINEERING

L T P C

3 0 0 3

**UNIT I Elements of Earthquake Seismology and Dynamics**

(09)

Mechanism of Earthquakes – Causes of earthquake – Earthquake Fault sources – Elastic Rebound theory – Seismic wave in Earthquake shaking – Definition of earthquake terms – Locating an earthquake – Quantification of earthquakes.

**UNIT II Ground Motion Characteristics**

(09)

Strong Motion Records – Characteristics of ground motion – Factors influencing ground motion – Estimation of frequency content parameters – Seismic site investigations – Evaluation of Dynamic soil properties.

**UNIT III Ground Response Analysis - Local Site Effects and Design Ground Motion**

(09)

Wave propagation Analysis – Site Amplification – Need for Ground Response Analysis – Shear Beam analysis – Methods of analyses – One Dimensional Analysis – Equivalent linear Analysis - Site effects – Design Ground Motion – Developing Design Ground Motion. Codal Recommendations.

**UNIT IV Seismic Stability Analysis**

(09)

Earthquake – Resistant Design of foundation of buildings – Design considerations – Geotechnical – Architectural – Structures – Capacity Design – Seismic analysis. Dynamic Analysis – Earth pressure due to ground shaking - Liquefaction – Susceptibility – evaluation – Cyclic stress approach – Liquefaction Resistance – Laboratory and Field Tests – Interpretation – Lateral Deformation – Codal recommendation

**UNIT V Earthquake Hazard Mitigation**

(09)

Seismic risk vulnerability and hazard – Percept of risk – Risk mapping – Hazard assessment – Maintenance and modifications to improve hazard resistance – Different type of foundation and its impact on safety – Ground Improvement Techniques.

**LECTURE: 45 TOTAL: 45hrs**

**Reference Books**

1. KameswaraRao, N.S.V., "Dynamics soil tests and applications", Wheller Publishing – New Delhi, 2000.
2. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice hall, International series Pearson Education (Singapore) Pvt. Ltd., 2004.
3. KameswaraRao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.
4. McGuire, R.K., "Seismic Hazard and Risk Analysis", Earthquake Engineering Research Institute. MNo – 10, ISBN 0-943198-01-1, 2004.
5. Mahanti, N.C., Samal, S.K., Datta, P., Nag N.K., "Disaster Management", Narosa Publishing House, New Delhi, India ISBN : 81-7319-727X-2006.

**12C8E5 BRIDGE ENGINEERING**

**L T P C**

**3 0 0 3**

**UNIT-I INTRODUCTION**

**(09)**

Components of a bridge structure – inspection and site investigations for a bridge – Determination of linear waterway, design discharge and scour depth – Economical span – Types and choice of bridges. IRC loading classifications – simple problems.

**UNIT-II SLAB BRIDGE**

**(09)**

Slab Bridge - Distribution of concentrated loads by IRC and Pigeaud's Method – Design of tee beam bridge – design of main girder– Design of cross girders – Load distribution by Courbon's Method – Skew slab Bridge.

**UNIT-III, BRIDGE & CULVERT**

**(09)**

Single span rigid frame bridge ( barrel or slab type only) – box culvert ( single vent only ). Balanced cantilever RC bridges – Design of articulations.

**UNIT-IV MODERN BRIDGES**

**(09)**

Temporary and movable bridges. RC Arch bridge ( open spandrel and string girder type only) – Cable stayed bridges – Suspension bridges – design principles only.

**UNIT-V BEARING, SUBSTRUCTURE AND REBUILDING OF STRUCTURES**

**(09)**

Bearings – types, functions – simple problems – substructures – abutment, pier – materials-stability requirements - Rebuilding of bridges – replacement – pier tops – girders – side sleeving and end launching methods.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Jhonson Victor .D., "Bridge Engineering", Oxford & IBH publishing Co., Ltd, New Delhi, 2003.
2. Ponnuswamy.S, "Bridge Engineering", Tata McGraw Hill Publishing Co., Ltd, New Delhi, 2001.

**Reference Books**

1. Vazirani V.N., Ratwani M.M., & Vaswani, "Bridge Engineering", Khanna publishers, 2000.
2. Bindra S.P., "Principles and practice of Bridge Engineering", Dhanpat Rai & Sons, New Delhi, 1995.
3. Krishnaraju, "Design of bridges", New age international publishing ltd, Newdelhi, 2005.



**12C8E6 ENVIRONMENTAL MANAGEMENT**

**L T P C**

**3 0 0 3**

**UNIT – I NATURE AND SCOPE OF ENVIRONMENTAL PROBLEMS**

**(09)**

Environment and sustainable development – Natural and human environmental disturbances – Global warming – acid rain – ozone depletion – effects and control - climate change conventions – Kyoto protocol – India's efforts for Environmental protection – Public policy and role of NGO's

**UNIT – II WATER POLLUTION AND CONTROL**

**(09)**

Fresh water and its pollution – Natural processes – sources and pollutants – pollution due to industrial, agricultural and municipal wastes – effects on streams - limitations of disposal by dilution – BOD consideration in streams – Oxygen Sag Curve – Strategies for sustainable water management Water management – Marine environment and its management – Water acts

**UNIT – III AIR AND NOISE POLLUTION**

**(09)**

Pollutant emissions - sources and sink – effects of air pollution on human health, vegetation and climate – Global effects – prevention and control of air pollution – Control of particulates – Air pollution surveys and sampling – Air quality monitoring - Air Act – Management of air pollution – Sound level – Effect of noise on people – Environmental noise control- noise pollution rules, 2000

**UNIT-IV SOLID WASTE MANAGEMENT AND SOIL POLLUTION**

**(09)**

Sources -- Characteristics -- Quantities -- Collection methods -- Processing and disposal techniques -- Onsite Handling, storage and processing -- sanitary landfill -- Incineration and pyrolysis -- Composting -- aerobic and anaerobic of composting -- Recycling and reuse of solid wastes -- Hazardous wastes -- Definition -- Sources & types only -- Integrated system for waste management -- The Basel convention

Land use and degradation – Management problems – strategies for sustainable land management – soil pollution – wetland conservation

**UNIT – V Environmental Management System**

**UNIT-V ENVIRONMENTAL MANAGEMENT SYSTEM**

**(09)**

Terminology – installation and common motives of EMS – Environmental standards – ISO 14000 (Series) – basic principles – Environmental Audit – Environmental Impact assessment - Trade rules and environmental protection – Practices For Waste Minimisation And Cleaner Production

**LECTURE: 45 TOTAL: 45hrs**

**Text Book**

1. N.K.Uberoi, *Environmental Management*, Excel Books, New Delhi(2006).

**Reference Books**

1. S.Vigneahwaran,M.Sundaravadivel and D.S.Chaudhary ,*EnvironmentalManagement*,
2. SCITECH Publications (India) Pvt.Ltd, Chennai & Hyderabad (2004).
3. Technobanoglous, *Environmental*, Mc Graw Hill Book Company (2006).

**12C8E7 TRAFFIC ENGINEERING AND MANAGEMENT**

**L T P C**

**3 0 0 3**

**UNIT – I INTRODUCTION**

**(09)**

Scope– Properties of traffic engineering elements – vehicle, driver and road characteristics - skid resistance and breaking efficiency – simple problems. Components of traffic Engineering – control mechanisms

**UNIT – II TRAFFIC SURVEYS**

**(09)**

Surveys – Classification - Volume, Speed and delay, origin and destination - parking, accidents-design of questionnaire for socio economic surveys – analysis-capacity of roads-level of services – interpretation of traffic studies and conclusions.

**UNIT – III TRAFFIC CONTROL**

**(09)**

Traffic signs – location and design recommendations - Road markings – Classification and design of traffic signals – signal co-ordination – Traffic islands and rotaries – Traffic control aids and street furniture – Regulation of traffic – Modern methods of traffic control.

**UNIT – IV TRAFFIC SAFETY AND MANAGEMENT**

**(09)**

Road accidents – types - causes and prevention with emphasis on engineering factors – Traffic management, Transport system management (TSM) and Transport Demand Management (TDM), restrictions on turning movements, one way streets, traffic segregation, tidal flow operation, exclusive bus lanes and other management measures – introduction to intelligent transport systems (ITS).

**UNIT – V TRAFFIC MANAGEMENT PROJECTS**

**(09)**

Design of parking facilities, on street and off street parking – case studies on area traffic management – street lighting – noise abatement –Basis of comprehensive traffic and transport studies – intersection improvements including design of roundabouts.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. Kadiyali.L.R., "Traffic Engineering and Transport planning", Khanna Publishers, 2004.
2. Salter.R.I., and Hounsell.N.B., "Highway Traffic Analysis and Design", Macmillan Press Ltd.,2000.

**Reference Books**

1. Manual of Transportation Engineering studies, Institution of Transportation Engineering, Prentice hall Publications, 1994.
2. John.E.Tyworth., "Traffic Management Planning", Operation and Control, Addison Wesley Publishing Company, 1997.

## 12C8E8 GROUND IMPROVEMENT TECHNIQUES

L T P C

3 0 0 3

### UNIT I DEWATERING

(09)

Introduction – Scope and necessity of ground improvement – New Technologies – Basic concepts – Drainage methods – Ground water lowering by well points – Deep well, Vacuum and Electro – Osmosis methods.

### UNIT II COMPACTION AND SAND DRAINS

(09)

In-situ compaction of cohesionless and cohesive soil – Shallow and deep compaction – Vibration methods – Vibro-compaction, Blasting, Vibrating probe, Vibratory rollers, Vibroflotation – Concept, Factors influencing compaction – Heavy Tamping – Vertical drains – Preloading with sand drains, Fabric drains, Wick drains – Relative merits of different methods – Limitations.

### UNIT III STONE COLUMN AND CONSOLIDATION

(09)

Precompression and consolidation – Dynamic consolidation – Electro-osmotic consolidation – Stone column – Lime piles – Earth reinforcement – Soil Nailing.

### UNIT IV SOIL STABILIZATION

(09)

Introduction – Stabilization methods – Mechanical, Chemical stabilisation – Cement, Lime, Bitumen – Electrical stabilization – Stabilization of expansive clays – Prewetting.

### UNIT V GROUTING

(09)

Introduction – Applications – Functions – Characteristics of grouts – Types of grout – Suspension and solution grouts – Basic requirements of grout – Displacement grouting – Compaction grouting – Permeation grouting – Grouting equipment – Grout monitoring.

**LECTURE: 45 TOTAL: 45hrs**

#### **Text Book**

1. Purushothama Raj, P., "Ground Improvement Techniques", Laxmi Publications (P) Ltd., New Delhi, 2005.

#### **Reference Books**

1. Moseley M.D., "Ground Treatment, Blackie Academic and Professional", 1998.
2. Shroff, A.V., "Grouting Technology, in Tunneling and Dam", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1999.
3. Koerner, R.M., "Designing with Geosynthetics (fourth edition)", Prentice Hall, New Jersey, 1999.

12C8E9 PREFABRICATED STRUCTURES

L T P C  
3 0 0 3

**UNIT I GENERAL PRINCIPLES OF FABRICATION**

(09)

Comparison with monolithic construction – Types of prefabrication – site and plant prefabrication – Economy of prefabrication – Modular coordination – Standardization – Planning for Components of prefabricated structures – Disuniting of structures – Design of simple rectangular beams and I beams – Handling and erection stresses – Elimination of erection stresses – Beams, columns – Symmetrical frames.

**UNIT II PREFABRICATED ELEMENTS**

(09)

Roof and floor panels; ribbed floor panels – wall panels – footings – Joints for different structural connections – Effective sealing of joints for water proofing – Provisions for non-structural fastenings – Expansion joints in pre-cast construction.

**UNIT III PRODUCTION TECHNOLOGY**

(09)

Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup – Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening.

**UNIT IV HOISTING TECHNOLOGY**

(09)

Equipments for hoisting and erection – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads.

**UNIT V APPLICATIONS**

(09)

Designing and detailing of precast unit for factory structures – Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames – Single storeyed buildings – slabs, beams and columns.

**LECTURE: 45 TOTAL: 45hrs**

**Text Books**

1. L. Makk, "Prefabricated Concrete for Industrial and Public Structures", Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
2. I. T. Koncz, "Manual of Precast Concrete Construction", Vol. I, II, III & IV, Berlin, 1971

**Reference Books**

1. CBRI, "Building materials and components", India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994
3. B. Lewicki, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam, London, New York, 1998
4. Structural Design Manual, "Precast Concrete Connection Details", Society for the Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009

