AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Gudur, Nellore Dist - 524101, A.P (India)

ACADEMIC REGULATIONS

B.Tech (Regular) Four Year Degree Programme

(Applicable for the batches admitted from the academic year 2013-14 and B.Tech Lateral Entry Scheme from the academic year 2014-15)

1. INTRODUCTION:

Academic Programmes of the institute are governed by rules and regulations approved by the Academic Council, which is the highest Academic body of the Institute. These academic rules and regulations are applicable to the students admitted from the academic year 2013-14 onwards into four year B.Tech Programmes.

Audisankara College of Engineering & Technology shall follow Year-wise pattern for First year courses and Semester pattern for II, III and IV year courses of all B.Tech Programmes being offered. An academic year for semester pattern shall consist of two semesters (I & II Semesters) from the second year onwards of each B.Tech Programme.

2. DURATION OF THE PROGRAMME:

The duration of the UG Programme is for four academic years. A student is permitted to complete the B.Tech Programme in a stipulated time frame of Eight consecutive years from the joining Academic Year. Students joining the B.Tech Programme in the first semester of second year directly through Lateral Entry Scheme (LES) shall have to complete the Programme in a stipulated time frame of Six consecutive years from the joining Academic Year. Otherwise they shall forfeit their seat in B.Tech Programme and their admission shall stand cancelled.

3. MINIMUM INSTRUCTION DAYS:

The first year of four year B.Tech Programme shall have a minimum of 180 instruction days and from second year onwards each semester shall have 90 instruction days with atleast 100 contact hours per each theory subject for yearly pattern and 50 for semester pattern. However, contact hours are generally three for a practical subject per week.

4. PROGRAMMES OFFERED (UNDER GRADUATE LEVEL):

Currently Audisankara College of Engineering & Technology is offering,

B.Tech Under Graduate Programmes in the following Engineering disciplines:

- Civil Engineering (**CE**)
- Electrical and Electronics Engineering (**EEE**)
- Mechanical Engineering (**ME**)
- Electronics and Communication Engineering (**ECE**)
- Computer Science and Engineering (**CSE**)

5. ELIGIBILITY CRITERION FOR ADMISSION:

5.1 ADMISSION CATEGORY:

Admissions are made under two categories for B.Tech (Regular) Programmes.

The eligibility criterion for admission into 1st year B.Tech. (Regular) Programme shall be as mentioned below:
Admissions in each Programme in the Institution are classified into

- **CATEGORY-A : (EAMCET Convener Quota)**
- **CATEGORY-B : (NRI/Management)**
- Admissions are made as per the guidelines of A.P State Council of Higher Education (APSCHE), Government of Andhra Pradesh.

5.2 LATERAL ENTRY CATEGORY:

The candidates having passed the qualifying exam (B.Sc., Graduation & Diploma holders) shall be admitted into the II year I Semester directly, based on the rank secured by the candidate at Engineering Common Entrance Test (ECET (FDH)) in accordance with the instructions received from the Convener, ECET and APSCHE. The candidate shall also satisfy any other eligibility requirements stipulated by the JNTUA, Anantapur and / or the Government of Andhra Pradesh from time to time.

6. COURSE STRUCTURE:

Each Programme of study shall consist of:

- General Courses: Humanities and Social Sciences: (5 to 10%)
- Basic Sciences: (15 to 20%)
- Engineering Sciences: (15 to 20%)
- Professional Subjects - Core :(50 to 60%)
- Professional Subjects - Electives: (10 to 15%)
- Personality Development Courses: (1%)

7.0 CONTACT PERIODS AND CREDITS:

Depending upon the complexity and volume of the course, the number of contact periods per week will be assigned. The Course Credits are broadly fixed based on the following norms:

- Lectures – One Lecture period per week is assigned one credit.
- Tutorials - Two tutorial periods per week are assigned one credit.
- Practical – 3 periods per week are assigned two credits.
- Practical course/ Personality Development course/ Technical Seminars/ Comprehensive Viva-Voce shall have 2 credits each in semester.
- Project Work Phase-I shall have 2 credits.
- Project Work Phase-II shall have 10 credits.
- However, some courses are prescribed with fixed number of credits depending on the complexity of the subject and relative importance.

7.1 Theory / Tutorial classes:

Each course is prescribed with a fixed number of lecture periods per week. During each lecture period, the course instructor shall deal with the concepts of the course content with the required analysis and applications. For certain courses, tutorial periods are prescribed in order to give exercises to the students and to closely monitor their learning ability and achievement to strengthen the subject knowledge.

7.2 Laboratory / Workshop Courses:

A minimum prescribed number of experiments / jobs / programs in each of these courses have to be performed by the students, who shall complete these in all respects and get each experiment evaluated by teacher concerned and certified by the Head of the Department concerned at the end of the year/ semester.

7.3 Programme Credits:

Each discipline of the B.Tech (Regular) Programme is designed to have a total of 200 credits, and the student shall have to complete the courses and earn all the credits to get B.Tech degree awarded.

However, B.Tech (Lateral Entry Scheme) student shall have to acquire 154 credits for the degree to be awarded.

7.4 Scheme of Instruction for 1st, 2nd, 3rd and 4th Years

The scheme of instruction and syllabi of all B.Tech Programmes are given separately.

8. EXAMINATIONS AND SCHEME OF EVALUATION:

8.1 INTERNAL EXAMINATIONS:

8.1.1 Theory Courses:

Each course is evaluated for **30** marks (**a+b+c**).

a) **5 marks** in each theory course shall be given to those students who put in attendance of that subject in a graded manner as given in Table 1. This incentive is aimed to motivate the students to become regular and not to miss instruction classes.

Table 1: Attendance based marks system

S. No	Attendance Range	Marks Awarded
1	Attendance of 75% and above but less than 78%	2 Marks
2	Attendance of 78% and above but less than 80%	3 Marks
3	Attendance of 80% and above but less than 90%	4 Marks
4	Attendance of 90% and above	5 Marks

b) (i) **Yearly Pattern:** For I B.Tech (Yearly pattern) there shall be three midterm examinations each for **20 marks** and 90 minutes duration in each theory subject as per the academic calendar announced in advance giving a test performance weightage of 80% for the highest test score and 20% for the average of remaining two midterm examinations for a total of 20 marks. Internal marks are awarded by conducting three midterm examinations as mentioned below:

- Midterm-I is designed and conducted covering first unit of syllabus.
- Midterm-II is conducted covering unit –II and half of unit-III contents.
- Midterm-III is conducted covering second half of unit-III and unit-IV contents.

ii) **Semester Pattern:** Two midterm examinations each for **20 marks** with the duration of 90 minutes each will be conducted for every theory course in a semester. The midterm marks shall be awarded giving a weightage of 80% in the midterm examination in which the student scores more marks and 20% in the remaining midterm examination.

Internal Examination Pattern for 20 Marks:

- Each Internal Examination Question Paper comprises of three questions covering the two units.
- Answering all the three questions is compulsory.
- Question 1 contains six one mark questions covering three questions from each unit and student has to answer four questions (4 Marks).
- Question 2 is from one unit and question 3 from the other unit. Questions 2 & 3 will have internal choice (Either/or). Each question is allotted 8 Marks.

c) **5 marks** are allocated for **Assignment tests.**

- There will be four Assignment tests per subject in year/semester pattern.
- One Assignment test is conducted from each unit.
- Five Assignment questions are given in advance from each unit out of which two questions given by the concerned teacher has to be answered during Assignment test.
- Average of Assignment tests marks is considered.

NOTE: A student who is absent for any Mid Term Examination/ Assignment Test, for any reason whatsoever, shall be deemed to have scored zero marks in that Mid Term Exam/ Assignment Test and no make-up test shall be conducted.

8.1.2 Drawing Subjects:

For subjects such as Engineering Drawing/ Building Drawing etc. the distribution of internal marks is as given below:

Table 2: Distribution of Internal Marks

Sl. No.	Criterion	Marks
1	Attendance	5
2	Day - to - Day Evaluation	10
3	Internal Examination	15

a) Engineering Drawing (Yearly pattern):

Three internal tests are conducted spanned at equal intervals. Test performance weightage of 80% for the highest test score and 20% for the average of remaining two midterm examinations for a total of 15 marks. Internal marks are awarded by conducting three midterm examinations as mentioned below:

- Midterm-I is designed and conducted covering first unit of syllabus.
- Midterm-II is conducted covering unit –II and half of unit-III contents.
- Midterm-III is conducted covering second half of unit-III and unit-IV contents.

b) Building Drawing etc., (Semester pattern):

Two internal tests are conducted spanned at equal intervals. Test performance weightage of 80% for the highest test score and 20% for the average of remaining midterm examination for a total of 15 marks. Internal marks are awarded by conducting two midterm examinations as mentioned below:

- Midterm-I is designed and conducted covering first unit of syllabus.
- Midterm-II is conducted covering the second unit of syllabus.

8.1.3 Laboratory Courses:

For Laboratory courses there shall be continuous evaluation during the year/semester for 30 internal marks. The break-up of internal marks to be awarded is as given below:

Table 3: Break-up of Internal Marks

Sl. No.	Criterion	Marks
1	Attendance	5
2	Conduct of experiments, Observation & Results in regular class work(Day-to-Day Performance)	15
3	Viva – voce and Internal Examination	10

In any semester a minimum of 90% of prescribed number of experiments/exercises specified in the syllabus for laboratory course shall be conducted. They shall complete these experiments/exercises in all respects and submit and get the record certified by the concerned internal lab teacher and the Head of the Department to become eligible to appear for the final end examination in the Laboratory Course.

8.1.4 Technical Seminar:

There shall be two Technical Seminars conducted in each discipline, Technical Seminar-I in the II B.Tech II semester and the Technical Seminar-II in the III B.Tech II semester. The distribution of internal marks for component of Technical seminar is given below:

Table 5: Distribution of Marks for component of Technical seminar

Sl. No.	Criterion	Marks
1	Seminar Report & Subject content	20
2	Seminar presentation & Viva – Voce Exam	30

A Technical Seminar shall have two components, one chosen by the student from the course work as an extension and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before a committee consisting of Head of the department, seminar supervisor and a senior faculty member. Each Technical Seminar shall be evaluated for 100 marks. Technical Seminar component-I for 50 marks and component-II for 50 marks making total 100 marks. (**Distribution of marks for 50:** 10 marks for report, 10 marks for subject content, 20 marks for presentation and 10 marks for queries).

8.1.5 Comprehensive Viva-Voce:

There shall be a Comprehensive Viva-Voce in IV B.Tech II Semester. The comprehensive Viva-Voce shall be evaluated in the topics covering the core aspects of the concerned discipline in which the candidate is likely to get graduated. The marks can be awarded based on the performance in viva-voce examination conducted by a committee consisting of **i)** Head of the Department **ii)** Two Senior Faculty members of the department **iii)** External Examiner appointed by the Principal. The comprehensive Viva-Voce shall be conducted for 100 marks. Of the 100 marks, 25 marks are allocated to each member of the committee.

8.1.6 Project Work:

The Project work is spread over to two semesters having Project Work Phase-I and Project Work Phase-II. Project Work Phase-I is included in IV B.Tech I Semester and Project Work Phase-II in IV B.Tech II Semester as detailed below:

A student has to select topic of his Project Work based on his interest and available facilities, in the IV B.Tech I semester which he will continue through IV B.Tech II semester also.

Project Work Phase-I: IV Year I Semester

The object of Project Work Phase-I is to enable the student to take up investigative study in the broad field of his branch of Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or three/four students in a group under the guidance of a supervisor/ guide. This is expected to provide a good initiation for the student(s) in R&D work.

The assignment normally includes:

- Survey and Study of published literature of on the assigned topic.
- Working out a preliminary approach to the problem relating to the assigned topic.
- Conducting preliminary analysis/ modeling/simulation/experiment/ design/ feasibility.
- Preparing a written report on the study conducted for presentation to the department.
- Final seminar presentation before Project Review Committee.

The supervisor/ guide will evaluate the execution of the project periodically.
Project Work Phase-I is allocated 100 marks with 2 credits. Out of 100, 25 marks are allocated for the supervisor/guide to be awarded based on periodical project reviews and submission of the report on the work done. 25 marks are allocated for the supervisor/guide and head of the department to be awarded based on seminar given by each student on the topic of the project. The other 50 marks shall be awarded on the basis of his presentation on the work done on his project by the Departmental committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.
The candidate is declared to have passed in Project work Phase-I when he gets 40% marks given by the Departmental Committee and 50% marks overall.

Project Work Phase-II: IV Year II Semester:

The Project work Phase-II will be an extension of Phase-I project work. The object of Project work phase-II is to enable the student to extend further the investigative study taken up as the project in Phase-I under the guidance of the supervisor/ guide from the department.

The assignment normally includes:

- Preparing an action plan for conducting the investigation including the team work.
- In depth study of the topic assigned.
- Review and finalization of the approach to the problem relating to the assigned topic.
- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Project Work Phase-II is allocated 50 internal marks. Out of 50, 25 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 25 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

8.1.7: Professional Ethics and Human Values / Qualitative and Quantitative Analysis:

The subject **Professional Ethics and Human Values** is included in the B.Tech Programme under mandatory and a theory course. It is treated equivalent to any other professional theory subject but only internal evaluation.

The other subject **Qualitative and Quantitative Analysis** is introduced in to the B.Tech Programme to equip with the necessary skill sets and to enhance the placement opportunities of students. It is also a theoretical subject equivalent to any other professional theory subject but only internal evaluation.

8.1.8: Mandatory Courses:

a) A Mandatory Course is one among the compulsory courses and does not carry any credits and is compulsory with examination (internal evaluation only). List of the mandatory courses will be notified at the beginning of the II B.Tech I Semester for all students and the student has to choose one mandatory course for self study mode/with class work at the beginning of the II B.Tech I Semester. All the students (regular & lateral entry students) shall complete one of the mandatory courses, with acceptable performance. The indicative list of the mandatory courses is given below.

1. Intellectual Property Rights – 13MA301
2. Sociology & Elements of Indian History for Engineers – 13MA302
3. Energy Studies – 13MA303
4. Rural Development – 13MA304
5. Law for Engineers – 13MA305
6. Clinical Psychology – 13MA306
7. Business Communication – 13MA307

b) Mandatory courses will be evaluated by conducting examination for duration of 90 minutes.

c) Students will have two chances every academic year to clear the mandatory course beginning from the II B.Tech I Semester. Further, the student has an option to change the mandatory course in case if he / she is unable to clear the mandatory course in the first two chances. However, provisional pass certificate of B.Tech degree will be issued only, when the student clears the mandatory course. Its result shall be declared with **"PASS"** or **"FAIL"** performance and included in the marks memorandum. Each student has to get **"PASS"** in the mandatory course prescribed to qualify for the award of degree.

8.1.9: Audit Courses:

a) A student can register for courses for audit only, when interested to supplement his /her knowledge and / or skills. These courses are optional and there will be no examination. The audit courses shall not be taken into account in determining the student's academic performance in any semester. They will be notified separately by the department. It is optional for students to register for these courses and seek their inclusion in marks memorandum (but not for earning credits). Courses in this category are technology oriented but not necessarily focused on the discipline under study.

8.2 YEAR / SEMESTER END EXAMINATIONS:

8.2.1 Theory Courses: 70 marks each:

The Year/ Semester end examination in each theory subject shall be conducted for 3 hours duration at the end of the year/semester for 70 marks. The question paper each theory subject for Year/Semester pattern shall be designed as per the following guidelines:

- Contains a total of nine questions.
  - A total of NINE questions.
  - Answer one Question from each Unit
  - The Eight questions are to be designed taking one question from each unit (Unit Wise Either or Type) of the four units.
  - In each question, one, two or more bits can be set, totaling 14 Marks with appropriate distribution of marks.
  - Question No.9 containing of 14 one mark questions. A minimum of three one – mark questions shall be set from each unit of the four units.

A student has to secure not less than a minimum of 35% of marks (25 marks) exclusively at the end year/semester examinations in each of the theory subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

8.2.2 Engineering Drawing:

The syllabus of Engineering Drawing subject comprises of four units. The end examination in Engineering Drawing shall be conducted for 3 hours duration at the end of the year. The question paper shall be designed in the following pattern:

- Question paper contains a total of nine questions.
  - Answer one Question from each Unit
  - The Eight questions are to be designed taking one question from each unit (Unit Wise Either or Type) of the four units.
  - In each question, one, two or more bits can be set, totaling 14 Marks with appropriate distribution of marks.
  - Question No.9 containing of 7 two mark questions. A minimum of two two – marks questions shall be set from unit-I, II & III of the four units.

A student has to secure not less than a minimum of 35% of marks (25 marks) exclusively at the end year/semester examinations in each of the subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

8.2.3 Lab Courses (Practical / Workshop): 70 marks

Out of 70 marks **50** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks & readings, calculation and result-35) and **15** marks for viva-voce examination with **5** marks for the record.

Each Year/Semester External Lab Examination shall be evaluated by an Internal Examiner along with an External Examiner appointed by the Principal.
A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (50 marks) (Internal & year/semester External Examination marks put together), subject to a minimum of 40% marks (28 marks) in the year/semester external examination.

8.2.4 Project Work Phase-II:

The semester end examination for project work done during IV B.Tech I semester and IV B.Tech II semester for 150 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the II Semester of IV B.Tech. The above committee evaluates the project work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/Supervisor respectively for a total of 100marks. Of the 50 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 40 marks. The evaluation of 150 marks is distributed as given below:

Table 11: Distribution of Project Work Marks

Sl. No.	Criterion	Marks
1	Report	100
2	Presentation & Viva – Voce	50

A candidate shall be declared to have passed in project work phase-II if he secures a minimum of 50% aggregate marks (100 marks) (Internal marks + External project marks), subject to a minimum of 40% marks (60 marks) in the project end examination.

9. YEAR/SEMESTER – WISE DISTRIBUTION OF CREDITS:

Table 12: Year/Semester –wise Credits distribution

YEAR/SEMESTER	No. of Credits for courses per year/semester Theory+ Lab/Drg/Proj/CVV/Semi	Total credits
I year	30+16	46
II year I semester	18+08	26
II year II semester	18+08	26
III year I semester	18+08	26
III year II semester	18+08	26
IV year I semester	18+08	26
IV year II semester	12+12	24
TOTAL CREDITS	200	200

(i) In first year the course of study consists of 6 theory subjects + Engineering Drawing + 4 laboratories and from second year onwards, each semester the course of study consists of 6 theory subjects + 3 laboratories. However, in the IV year II semester, there shall be only 4 theory subjects in addition to the project work and comprehensive viva – voice examination.

(ii) All the Technical Seminars, Professional Ethics & Human Values and Aptitude, Arithmetic Reasoning & Comprehension are credit based**.**

10. ATTENDANCE REGULATIONS AND CONDONATION:

i) A student shall be eligible to appear for end semester examinations, if he acquires a minimum of 75% attendance in aggregate of all the subjects.

(ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (65% above and below 75%) in each semester may be granted on the recommendation of the College Academic Committee. However, granting condonation is purely at the discretion of Principal of the college.

(iii) A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered next.

(iv) Shortage of Attendance below 65% in aggregate shall in no case be condoned.

(v) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that particular semester and their registration for examination shall stand cancelled.

(vi) A stipulated fee shall be payable towards condonation of shortage of attendance if granted.

(vii) Attendance may also be condoned for those students who participate in prestigious sports and co and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose and recommended by the concerned authority.

(viii) Attendance in Project Work Phase-II in IV B.Tech II Semester is not included in the calculation of final attendance. However, the student has to accquire 75% of attendance aggregate other than attendance of Project Work Phase-II in IV B.Tech II Semester.

11. MINIMUM ACADEMIC REQUIREMENTS:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.10.

A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory/drawing subject if he secures not less than a minimum of 35% of marks exclusively at the end year/semester examinations in each of the subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 40% marks in both external and internal components put together to become eligible for passing in the subject.

1. A candidate shall be declared to have passed in individual lab/project course if he secures a minimum of 50% aggregate marks (Internal & year/semester end examination marks put together), subject to a minimum of 40% marks in the year/semester end examination.
2. A student shall be promoted to next semester, if he satisfies the minimum attendance requirement.
3. A Student shall be promoted from II year to III year, if he fulfills the academic requirements of securing a minimum of 36 credits from:
   a) One regular and one supplementary examination of I Year.
   b) One regular examination of II Year I Semester.

4. A student shall be promoted from III year to IV year if he fulfills the academic requirements of securing a minimum of 62 credits from:
   a) Two regular and two supplementary examinations of I Year.
   b) Two regular and one supplementary examinations of II Year I Semester.
   c) One regular and one supplementary examinations of II Year II Semester.
   d) One regular examination of III Year I Semester.

   Irrespective of whether the candidate takes the end examination or not as per the normal course study. And in case of getting detained for want of credits by points 4&5, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of III B.Tech I Semester and IV I Semester respectively.
5. There shall be supplementary examinations along with the regular end examinations enabling the students to give a fair chance to clear the subject if failed.
6. However, advance supplementary examinations shall be conducted for all such students who had failed at the IV B.Tech II Semester subjects of their study.
7. A student shall register for all the subjects and earn all the 200 credits as indicated in the course structure within eight academic years (6 consecutive years for LES students) from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

12. AWARD OF CLASS:

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

Table 13: Award of Division

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

13. TRANSITORY REGULATIONS:

A student, who is detained or discontinued in the year/semester, on readmission shall be required to do all the courses in the curriculum prescribed for such batch of students in which the student joins subsequently.

13.1 A student who is following the JNTUA, Ananthapuramu curriculum, detained due to lack of credits/ attendance at the end of the first semester of second year, shall join the autonomous batch of I Semester of II B.Tech. Such students will study all the courses prescribed for that batch, in which the student joins. The first year marks shall not be converted in to course credits. However, the student has to clear all his first year backlog subjects if any by appearing in the supplementary examinations of JNTUA, Ananthapuramu when conducted and courses prescribed in Autonomous stream for the Award of Degree. The class will be awarded based on the academic performance of a student. Such candidates will be considered on par with lateral entry candidates of autonomous stream and will be governed by the regulations applicable to lateral entry candidate's category.

13.2. A student who is following the JNTUA, Ananthapuramu curriculum, detained due to lack of credits/ attendance at the end of the second semester of second B.Tech, and also at the subsequent semesters, shall join the autonomous batch at the appropriate semester. Such candidates shall be required to pass in all the courses in the Programme prescribed by concerned BOS for such batch of students, to be eligible for the award of degree. However, exemption will be given in all those courses of the semester(s) of the batch, which the candidate joins now, which he had passed earlier. The student has to clear all his backlog subjects by appearing in the supplementary examinations, conducted by JNTUA, Ananthapuramu and College (Autonomous Stream) for the Award of Degree. The class will be awarded based on the academic performance of a student in the JNTUA Pattern and academic regulations of JNTUA will be followed.

14. READMISSION CRITERIA:

A Candidate, who is detained in a year/semester due to lack of attendance/credits, has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling all the required norms stipulated by the college in addition to paying the required fee.

15. SUPPLEMENTARY EXAMINATIONS:

Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

16. CONDUCT AND DISCIPLINE:-

(a) Students shall conduct themselves within and outside the premises of the Institute in a descent and dignified manner befitting the students of Audisankara College of Engineering & Technology.

(b) As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with.

(c) The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

  (i) Lack of courtesy and decorum; indecent behavior anywhere within or outside the college campus.
  (ii) Damage of college property or distribution of alcoholic drinks or any kind of narcotics to fellow students / citizens.

(d) Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

(e) Mutilation or unauthorized possession of library books.

(f) Noisy and unruly behavior, disturbing studies of fellow students.

(g) Hacking in computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber crime etc.

(h) Usage of camera /cell phones in the campus.

(i) Plagiarism of any nature.

(j) Any other act of gross indiscipline as decided by the college academic council from time to time.

(k) Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarring from examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

(l) For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief Warden, the concern Head of the Department and the Principal respectively, shall have the authority to reprimand or impose fine.

(m) Cases of adoption of unfair means and/ or any malpractice in an examination shall be reported to the principal for taking appropriate corrective action.

(n) All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Academic council of the college.

(o) The Institute Level Standing Disciplinary Action Committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

(p) The Principal shall deal with any problem, which is not covered under these rules and regulations.

(q) **"Grievance and Redressal Committee" (General)** constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters.

(r) All the students must abide by the code and conduct rules prescribed by the college from time to time.

17.0 RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Is found copying in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate will be cancelled.
3.	Comes in alcohol drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
4.	Smuggles the Answer book or a part there of additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Leaves the exam hall taking away answer script or intentionally tears of the script or	Expulsion from the examination hall and cancellation of performance in that subject and

	any part thereof inside or outside the examination hall.	all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
6.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate will also be debarred and forfeit the seat.
7.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate will also be debarred and forfeit the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate will also be debarred for two consecutive semesters from class work and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case registered against him.
8.	Refuses to obey the orders of the Chief Superintendent/Asst. Superintendent/ any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall causing any injury to him or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case registered against them.

	examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
9.	Is a student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clauses 6 to 8.	In case of students of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
11.	Is detected copying on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	Indulging in any malpractice which is not covered in the above clauses 1 to 11 if detected shall be reported to the College Authorities for further action to award suitable punishment.	Appropriate action will be taken as recommended by the College Authorities.

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.

18. AWARD OF RANK:

The rank shall be awarded based on the following:

- Only such candidates, who pass the Final Semester end examination at the end of the II Semester of IV B.Tech (Final Semester) after admission as regular final year students along with the others in their batch and become eligible for the award of the Degree, shall be eligible for the award of rank. Candidates, who lose one year / one or more Semesters of study for any reason what so ever are not eligible for the award of rank.
- Ranks shall be awarded in each branch of study for the top five students appeared for the Regular Examinations.
- For the purpose of awarding rank in each branch, the aggregate of marks (Internal + External) of all courses (put together) in all the four years, secured at the first attempt only shall be considered.
- Award of prizes, scholarships, or any other Honors shall be based on the rank secured by a candidate, consistent with the guidelines of the Donor, wherever applicable.

19. GENERAL:

(a) Where the words “he” “him” “his” occur in the regulations, they include “she”, “her”.

(b) The academic regulation should be read as a whole for the purpose of any interpretation.

(c) In the case of any dues or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

(d) The Institute may change or amend the academic regulations or syllabi at any time duly approved by Academic Council and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

20. CHANGE OF BRANCH:

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

AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Gudur, Nellore Dist - 524101, A.P (India)

(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2014-2015 onwards)

1. Award of B.Tech. Degree

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

i. Pursue a course of study for not less than three academic years and in not more than six academic years.

ii. Register for 154 credits from II Year to IV Year of Regular B.Tech. Program

2. Students, who fail to fulfill the requirement for the award of the degree in six consecutive academic year from the year of admission, shall forfeit their seat.

3. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements.

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the seminar he should secure 40% in the internal evaluation.

ii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 39 credits from the following examinations.

   a. Two regular and one supplementary examinations of II year I semester.
   b. One regular and one supplementary examinations of II year II semester.
   c. One regular examination of III year I semester.

   Irrespective of whether the candidate takes the end examination or not as per the normal course of study and in case of getting detained for want of credits the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Fourth year I semester.

4. Course Pattern

i. The entire course of study is three academic years on semester pattern.

ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for the subject at the next supplementary examination offered.

iii. When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester is offered after fulfillment of academic regulations, whereas he continues to be in the academic regulations he was first admitted.

5. Award of Class:

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

Class Awarded	% of marks to be secured
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

6. All other regulations as applicable for B.Tech. Four-year degree course (Regular) will hold good for B.Tech. (Lateral Entry Scheme) students.

AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Gudur, Nellore Dist - 524101, A.P (India)

Course Structure for B.Tech (Civil Engineering) Regular Programme Applicable for students admitted from Academic Year 2013-14

B.Tech I Year – Civil Engineering

Sl.No	Course Code	Subject	Scheme of instruction (Periods per week)				Scheme of Examination			No. of Credits
			Th	Tu	Drg	Lab	IM	EM	Total Marks	
1	13HS101	Communicative English	2	-	-	-	30	70	100	3
2	13HS102	Engineering Physics	2	-	-	-	30	70	100	3
3	13HS103	Engineering Chemistry	2	-	-	-	30	70	100	3
4	13HS104	Engineering Mathematics-I	3	1	-	-	30	70	100	5
5	13HS106	Environmental Science	2	-	-	-	30	70	100	3
6	13HS107	Computer Programming	3	1	-	-	30	70	100	4
7	13HS108	Engineering Mechanics	3	1	-	-	30	70	100	5
8	13HS109	Engineering Drawing	2	-	4	-	30	70	100	4
9	13HS110	Computer Programming Lab	-	-	-	3	30	70	100	4
10	13HS111	Engineering Workshop and IT Workshop	-	-	-	3	30	70	100	4
11	13HS112	Engineering Physics and Engineering Chemistry Lab	-	-	-	3	30	70	100	4
12	13HS113	English Language and Communication Skills Lab	-	-	-	3	30	70	100	4
Contact Periods / Week			**19**	**3**	**4**	**12**	**360**	**840**	**1200**	
Total Periods / Week			**38**				**Total Credits**			**46**

Note: Th: Theory, Tu: Tutorial, Drg: Drawing, Lab: Laboratory, IM: Internal Marks, EM: External Marks

- The students attend the Engineering Workshop and IT Workshop in alternate Weeks. The end exam shall be conducted separately and average of the two exams will be recorded by the Autonomous exam section.
- The students attend the Engineering Physics Lab and Engineering Chemistry Lab in alternate Weeks. The end exam shall be conducted separately and average of the two exams will be recorded by the Autonomous exam section.

B.Tech II Year I Semester – Civil Engineering

Sl.No	Course Code	Subject	Scheme of instruction (Periods per week)				Scheme of Examination			No. of Credits
			Th	Tu	Drg	Lab	IM	EM	Total Marks	
1	13HS116	Mathematics-II	3	-	-	-	30	70	100	3
2	13HS120	Professional Ethics and Human Values	2	-	-	-	30	70	100	2
3	13CE301	Building Materials, Planning and Construction	3	-	-	-	30	70	100	3
4	13CE302	Strength of Materials-I	3	1	-	-	30	70	100	3
5	13CE303	Fluid Mechanics	3	1	-	-	30	70	100	3
6	13CE304	Surveying-I	3	1	-	-	30	70	100	3
7	13CE305	Engineering Geology	3	-	-	-	30	70	100	3
8	13CE306	Strength of Materials Lab	-	-	-	3	30	70	100	2
9	13CE307	Engineering Geology Lab	-	-	-	3	30	70	100	2
10	13CE308	Survey Field Work –I	-	-	-	3	30	70	100	2
Contact Periods / Week			**20**	**3**	**-**	**9**	**300**	**700**	**1000**	
Total Periods / Week			**32**				**Total Credits**			**26**

B.Tech II Year II Semester – Civil Engineering

Sl.No	Course Code	Subject	Scheme of instruction (Periods per week)				Scheme of Examination			No. of Credits
			Th	Tu	Drg	Lab	IM	EM	Total Marks	
1	13HS117	Mathematics-III	3	-	-	-	30	70	100	3
2	13CE401	Elements of Electrical and Mechanical Engineering	3	-	-	-	30	70	100	3
3	13CE402	Strength of Materials-II	3	1	-	-	30	70	100	3
4	13CE403	Hydraulics and Hydraulic Machinery	3	1	-	-	30	70	100	3
5	13CE404	Surveying-II	3	1	-	-	30	70	100	3
6	13CE405	Concrete Technology	3	-	-	-	30	70	100	3
7	13CE406	Fluid Mechanics and Hydraulic Machinery Lab	-	-	-	3	30	70	100	2
8	13CE407	Concrete Technology Lab	-	-	-	3	30	70	100	2
9	13CE408	Survey Field work-II	-	-	-	3	30	70	100	2
10	13CE409	Technical Seminar-I	-	1	-	-	100	-	100	2
Contact Periods / Week			**18**	**4**	**-**	**9**	**370**	**630**	**1000**	
Total Periods / Week			**31**				**Total Credits**			**26**

B.Tech III Year I Semester – Civil Engineering

Sl.No	Course Code	Subject	Scheme of instruction (Periods per week)				Scheme of Examination			No. of Credits
			Th	Tu	Drg	Lab	IM	EM	Total Marks	
1	13HS121	Qualitative and Quantitative Analysis	2	-	-	-	30	70	100	2
2	13CE501	Structural Analysis –I	3	1	-	-	30	70	100	3
3	13CE502	Water Resource Engineering-I	3	-	-	-	30	70	100	3
4	13CE503	Reinforced Concrete Structures-I	3	1	-	-	30	70	100	3
5	13CE504	Design of Steel Structures-I	3	1	-	-	30	70	100	3
6	13CE505	Soil Mechanics	3	-	-	-	30	70	100	3
7	13CE506	Environmental Engineering	3	-	-	-	30	70	100	3
8	13CE507	Geotechnical Engineering Lab	-	-	-	3	30	70	100	2
9	13CE508	Environmental Engineering Lab	-	-	-	3	30	70	100	2
10	13CE509	Building Drawing	-	-	3	-	30	70	100	2
Contact Periods / Week			**20**	**3**	**3**	**6**	**300**	**700**	**1000**	
Total Periods / Week			**32**				**Total Credits**			**26**

B.Tech III Year II Semester – Civil Engineering

Sl.No	Course Code	Subject	Scheme of instruction (Periods per week)				Scheme of Examination			No. of Credits
			Th	Tu	Drg	Lab	IM	EM	Total Marks	
1	13CE601	Structural Analysis –II	3	1	-	-	30	70	100	3
2	13CE602	Water Resource Engineering-II	3	-	-	-	30	70	100	3
3	13CE603	Reinforced Concrete Structures-II	3	1	-	-	30	70	100	3
4	13CE604	Design of Steel Structures-II	3	1	-	-	30	70	100	3
5	13CE605	Foundation Engineering	3	-	-	-	30	70	100	3
6	13CE606	Transportation Engineering-I	3	-	-	-	30	70	100	3
7	13CE607	Computer Aided Drafting	-	-	-	3	30	70	100	2
8	13CE608	Highway Engineering Lab	-	-	-	3	30	70	100	2
9	13HS122	Soft Skills Lab	-	-	-	3	30	70	100	2
10	13CE609	Technical Seminar-II	-	1	-	-	100	-	100	2
Contact Periods / Week			**18**	**4**	**-**	**9**	**370**	**630**	**1000**	
Total Periods / Week			**31**				**Total Credits**			**26**

B.Tech IV Year I Semester – Civil Engineering

Sl.No	Course Code	Subject	Scheme of instruction (Periods per week)				Scheme of Examination			No. of Credits
			Th	Tu	Drg	Lab	IM	EM	Total Marks	
1	13CE701	Advanced Structural Engineering	3	1	-	-	30	70	100	3
2	13CE702	Estimation and Quantity Surveying	3	1	-	-	30	70	100	3
3	13CE703	Transportation Engineering-II	3	-	-	-	30	70	100	3
4	13CE704	Prestressed Concrete	3	1	-	-	30	70	100	3
5	13CE705 13CE706 13CE707 13CE708	**Elective-I** 1.Earthquake Engineering 2.Advanced Foundation Engineering 3.Repair and Rehabilitation of Structures 4.Water Resources Systems	3	-	-	-	30	70	100	3
6	13CE709 13CE710 13CE711	**Open Elective** 1. Air Pollution and Control 2.Remote Sensing and GIS 3.Disaster Management and Mitigation	3	-	-	-	30	70	100	3
7	13CE712	Computer Aided Analysis & Design Lab	-	-	-	3	30	70	100	2
8	13CE713	Irrigation Design Practice Lab	-	-	-	3	30	70	100	2
9	13CE714	Field Training and Survey Camp	-	-	-	-	100	-	100	2
10	13CE715	Project Work - Phase-I	-	-	-	2	100	-	100	2
Contact Periods / Week			**18**	**3**	**-**	**8**	**440**	**560**	**1000**	
Total Periods / Week			**29**				**Total Credits**			**26**

B.Tech IV Year II Semester – Civil Engineering

Sl.No	Course Code	Subject	Scheme of instruction (Periods per week)				Scheme of Examination			No. of Credits
			Th	Tu	Drg	Lab	IM	EM	Total Marks	
1	13CE801	Fundamentals of Finite Element Methods in Civil Engineering	3	1	-	-	30	70	100	3
2	13HS118	Managerial Economics and Financial Analysis	3	-	-	-	30	70	100	3
3	13CE802 13CE803 13CE804 13CE805	**Elective-II** 1.Bridge Engineering 2.Ground Improvement Techniques 3.Environmental Impact Assessment and Management 4.Hydro Power Engineering	3	1	-	-	30	70	100	3
4	13CE806 13CE807 13CE808 13CE809	**Elective-III** 1.Ground Water Development and Management 2.Construction Project Management 3.Experimental Stress Analysis 4.Pavement Analysis and Design	3	0	-	-	30	70	100	3
5	13CE810	Comprehensive Viva - Voce	-	-	-	-	-	100	100	2
6	13CE811	Project Work – Phase-II	-	-	-	-	50	150	200	10
Contact Periods / Week			**12**	**2**	**-**	**-**	**180**	**520**	**700**	
Total Periods / Week			**14**				**Total Credits**			**24**

AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY: GUDUR
(AUTONOMOUS)

Detailed Syllabus

I B.Tech (CE)	L	T	P	[C]
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(13HS101) COMMUNICATIVE ENGLISH

Objectives:
- To improve the language proficiency of the students in English with an emphasis on LSRW skills.
- To equip the students to study academic subjects with greater facility through theoretical and practical components of the syllabus.
- To develop study skills as well as communication skills in formal and informal situations.

1. SYLLABUS :

Listening Skills:

Objectives

1. To enable students to develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and dialects.

Students should be given practice in listening and identifying the sounds of English language and to mark stress , right intonation in connected speech.

- Listening for general content
- Intensive listening
- Listening to fill up information
- Listening for specific information

2. TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content are prescribed and divided into Four Units:

For Detailed study: **ENJOYING EVERYDAY ENGLISH**, Sangam Books (India) Pvt Ltd Hyderabad, 2009

For Non-detailed study: **INSPIRING LIVES**, Maruti Publications, Guntur, 2009

UNIT –I:

Heaven's Gate: Introduction of the Author and Lesson, Paragraphs and Description, Introduction of Leh,… Greeting and Leave Taking and Introducing, Naming Words, Homonyms, Homophones, Homographs, Synonyms and Antonyms.

Mokshagundam Visvesvaraya: Introduction of Visvesvaraya, Childhood, Education, Projects he Undertook, Social Reforming Activities….. Synonyms and Antonyms.

UNIT –II:

Cuddalore Experience: Introduction of the Author and Lesson, Paragraphs and Description, Description of Tsunami, Damage Caused, Immediate Rescue Operations Implemented….. Official Reports, Congratulating, Offering Sympathy and Condolences and Making Complaints, Tenses, Phrasal Verbs.

Mother Teresa: Introduction of Teresa, Childhood, Humanity Work, Honours and Awards…. One Word Substitutes.

UNIT –III:

Odds against us: Introduction of the Author and Lesson, Paragraphs and Description, Differences between Foreign Movies and Indian Movies, Three Factors that Guide a Director….. Information Transfer, Conjunctions and Prepositions, Technical Vocabulary.

Charlie Chaplin: Introduction of Chaplin, His Films, His married Life….. One Word Substitutes

UNIT –IV:

Exercises on:

Remedial Grammar covering Common errors in English, Use of Articles and Prepositions, Active/Passive Voice, Reported speech, Tenses, Degrees of Comparison, conditional Clauses (If/Weather/Unless), One Word Substitutions, Idiomatic Expressions, Synonyms & Antonyms, Words often confused, Question Tags.

Exercises on:

Letter Writing

Report Writing

Reference Books:

1. Meenakshi Raman and Sangita Sharma, Technical Communication , Principle and Practice, OUP, 2009
2. Essential Grammar in Use, (with CD) 3/e, Cambridge University Press, 2009
3. M.Ashraf Rizvi, Resumes and Interviews, Tata – McGraw Hill, 2009
4. Robert J. Dixson , Everyday Dialogues in English, Prentice-Hall of India Ltd., 2006.
5. Farhathullah, Communication Skills for Technical Students, T.M., Orient Blackswan, 2008

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(13HS102) ENGINEERING PHYSICS

Objectives: To Impart the awareness among the Engineering Students about the present day technologies in Physics to reach the heights of technical globe with latest technologies in Fiber Optics, Nanotechnology, Super Conductivity and Lasers.

UNIT – I:

Optics, Fiber Optics and Lasers

Interference: Introduction, Interference in thin film by reflection, Newton's rings.

Diffraction: Introduction, Fraunhoffer diffraction due to single slit, Diffraction Grating.

Fiber Optics: Construction of Optical Fiber, Principle of Optical Fiber, Acceptance angle and Acceptance cone, Numerical aperture, Types of Optical Fibers, Fiber optic communication system and its advantages, Attenuation in Optical Fibers, Applications of Optical Fibers.

Lasers: Introduction, Characteristics of Lasers, Spontaneous & Stimulated emission of radiation, Population Inversion, Pumping Methods, Components of Lasers, Ruby Laser, Helium Neon Laser, Semiconductor laser, Applications of Lasers.

UNIT – II:

Crystal Structures, X-Ray Diffraction and Semiconductors

Crystal Structures, X-Ray Diffraction: Introduction, Space Lattice, Basis, Unit Cell, Lattice Parameters, Bravais Lattices, Crystal systems, Expression for Lattice constant, Structure and Packing factor of SC, BCC & FCC crystals, Structure of NaCl and Diamond, Crystal Planes, Crystal directions and Miller Indices , Important features of Miller Indices, Expression for Interplanar spacing in rectangular coordinate systems, X-ray Diffraction by crystal planes, Bragg's law, Laue Method, Powder Method .

Semiconductors: Introduction, Intrinsic semiconductor and carrier concentration, Extrinsic semiconductor and carrier concentration, Law of mass action, Electrical conductivity in semiconductors, Drift and Diffusion, Einstein relation, Hall Effect, Direct and Indirect Band gap semiconductors, LED, Photodiodes.

UNIT–III:

Principles of Quantum Mechanics, Band Theory of Solids and Magnetic Properties:

Principles of Quantum Mechanics : Waves and particles, de-Broglie Hypothesis, Matter waves, Heisenberg Uncertainty principle, Applications of Heisenberg uncertainty principle, Schrodinger time independent wave equation, Physical significance of wave function, Particle in one dimensional potential box, Fermi Dirac Distribution function, Electron Scattering and Sources of electrical resistance.

Band Theory of Solids: Electron in a periodic potential, Kronig-Penny Model (qualitative treatment only), Origin of Energy Bands formation in Solids, Effective mass of electron, Classification of solids into Conductors, Semiconductors & Insulators based on Band theory.

Magnetic Properties: Magnetic susceptibility, Origin of Magnetic moment-Bohr magneton, Classification of magnetic materials, Domain theory of ferromagnetism, Hysteresis curve, Ferrites and its applications, Soft and hard magnetic materials.

UNIT – IV

Superconductivity & Nanotechnology

Superconductivity: Introduction, Properties of superconductors, Meissner Effect, Type – I and Type – II Superconductors, Flux Quantization, Penetration Depth. Josephson Effect, BCS theory, Applications of superconductors, High Temperature Superconductors.

Nanotechnology: Origin of Nanotechnology, Nanoscale, Surface area to volume ratio, Quantum Confinement effect, Properties of nanomaterials, Electrical properties, Optical properties, Magnetic Properties, Mechanical properties, Fabrication of nanomaterials by Ball Milling, Plasma Arcing, Chemical vapour deposition, Sol-Gel method, Electrode position methods and Applications of Nanomaterials.

CNT-Introduction, Types, Properties, Production, Applications of CNTS, Graphene and Graphene based FET.

Text Books:

1. V. Rajendran, K.Thyagarajan Engineering Physics , III Edition, 2012.Tata MacGraw Hill Publishers
2. P.K.Palanisamy , Engineering Physics, II Edition 2010 Scitech Publishers.

Reference Books:

1. S. ManiNaidu ,Engineering Physics, I Edition, 2012. Pearson Education
2. M. Arumugam , Engineering Physics II Edition, 1997 , Anuradha Publications.
3. A.J. Dekkar , Solid State Physics , Latest edition, 2012. McMillan Publishers
4. Gaur and Gupta Dhanapati , Engineering Physics, 7th Edition, 1992 Rai Publishers ,.
5. B S Murthy, P.Shankar, Baldev Raj B BRath, James Murday , I Edition, 2012.

Text book of Nanoscience and Nanotechnology:, University Press,

6. H.S. Philip Wong, Deji Akinwande , Carbon Nanotubes and Graphene Device Physics –, Cambridge University Press, 2011.

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(13HS103) ENGINEERING CHEMISTRY

Objectives:

- The Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.

UNIT – I:

Water Technology & Fuel Technology:

Water Technology: Sources of water, Hardness of water, units of hardness, Estimation of hardness by EDTA method, Analysis of water – Dissolved oxygen, Estimation of Chloride, Alkanity, Acidity.

Sterilization of water: Chlorination, Ozonisation, Addition of Bleaching powder.

Water for Industrial Purpose: Water for steam generation, Boiler troubles – priming and foaming, Boiler corrosion, sludges and scales, caustic embrittlement.

Water treatment: Internal treatment – colloidal, phosphate, calgon, carbonate and sodium aluminate conditioning. Softening methods of water – Ion exchange process. Determination of brakish water – Reverse Osmosis.

Fuel Technology: Definition, classification, characteristics of good fuel.

Solid fuels: Coal, classification, Metallurgical coke – characteristics and Manufacturing (Otto-Halfman's by product oven method)

Liquid fuels: Petroleum, origin, refining, and fractional distillation, synthetic petrol.

Gaseous fuels: Composition and preparation of producer gas, water gas, bio gas, coal gas, natural gas.

Calorific Value and its Units, flue gas analysis by Orsat's apparatus.

Lubricants: Functions, Classification and Properties – viscosity, viscosity index, flash and fire point, pour and cloud point, aniline point, mechanical strength, neutralization number.

UNIT – II:

Electrochemistry and Science of corrosion:

Electrochemistry : Conductance, Equivalent conductance, Molecular conductance, conduct metric titrations, Applications of conductivity measurement., numerical calculations, review of electro chemical cells-Galvanic cells.

Batteries: Ni-Cd cell, Lithium ion cells, fuel cells – Hydrogen Oxygen Fuel cell, Methanol fuel cell.

Science of corrosion: Definition and Types of corrosion – Dry corrosion and wet corrosion. Galvanic series, Galvanic corrosion and concentration cell corrosion.

Factors influencing corrosion,

Control of corrosion: Use of inhibitors, Sacrificial Anode, Impressed current, Electroplating and Electro less plating (Cu and Ni).

UNIT – III:

Polymers and advanced Engineering Materials

Polymers: Basic concepts, Types of polymerization – Addition, condensation, co-polymerization.

Plastics: Thermoplastics and Thermosetting plastics, preparation, properties and Engineering uses of Teflon, PVC, Bakelite, Nylon.

Natural Rubber (Elastomers): Processing, Compounding, Vulcanization of Natural Rubber.
Synthetic Rubber: Buna – S, Buna – N, Poly urethane, poly sulphide and silicone Rubber.
Advanced Engineering Materials:
Conducting Polymers: Synthesis and Applications of poly acetylene, poly aniline.
Liquid Crystals: Definition, properties, and classification and Engineering applications.
Inorganic Polymers: Basic Introduction, Silicones, Polyphospazins (-(R) 2 – P = N -) and applications.

UNIT – IV:
Building Materials and Photo Chemistry
Cement: Definition, Composition and Manufacture of Portland cement, Analysis, setting and hardening of cement.
Refractories: Definition, classification, criteria of good Refractory- Refractoriness, Refractoriness under load, Chemical inertness, Dimensional stability, Thermal spalling, porosity, Thermal expansion, Thermal conductivity, Abrasion Resistance, Electrical conductivity. Causes for failure of refractories.
Photo Chemistry:
Photochemical Reactions, Difference between Photochemical reactions and thermochemical reactions. Absorption of light: Beer-Lambert's law.
Photo-physical Processes: (a) Fluorescence. (b) Phosphorescence and (c) Chemi-luminiscence applications.

Text Books:

1. Prof. K.N.Jayaveera, Dr.G.V.Subba Reddy and Dr.C. Ramachandraiah, , Engineering Chemistry Fourth Edition, 2012 McGraw Hill Higher Education, New Delhi.
2. Jain & Jain, Text book of Engineering Chemistry , 15th Edition 2009, Dhanpat Rai Publishing Company, New Delhi.

Reference Books:

1. S.S Dhara, S.S.Umare, A Text book of Engineering Chemistry ,12th Edition, 2010. S. Chand Publications, New Delhi,
2. K.B.Chandra Sekhar, UN.Das and Sujatha Mishra Engineering Chemistry , 2nd Edition, 2012 SCITECH, Publications India Pvt Limited, Chennai
3. K. Sesha Maheswaramma and Mrudula Chugh , Engineering Chemistry, First Edition, 2013 PearsonEducation
4. C.V. Agarwal, Chemistry of Engineering Materials Varanasi,2008. Tara Publication.

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(13HS104) ENGINEERING MATHEMATICS-I

Objectives: The Subject is aimed at developing the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many engineering fields.

UNIT – I:

Differential & Integral Calculus

Mean Value Theorems – Rolle's, Lagrange's, Cauchy's, Taylor's, and Maclaurin's theorem (without proofs) with simple related problems.

Functions of several variables - Jacobian, functional dependence, Taylor's and Maclaurin's series(without proof) with two variables , maxima & minima of function of two and three variables.- Lagrange's method of multipliers with three variables only

Radius of Curvature – Cartesian, Polar, Parametric forms and Radius of Curvature at Origin (Newton's Method).

Curve Tracing – Cartesian, Polar, Parametric forms.

Multiple Integrals - Evaluation of Double Integrals – Change of Order of Integration- Change of Variables- Evaluation of Triple Integrals.

UNIT-II:

Ordinary Differential Equations:

Differential Equations of First Order and First Degree: Exact Differential Equations, Integrating factors, Linear Differential Equations, Bernoulli's Differential Equations, Orthogonal Trajectories of curves, Newton's Law of cooling, Law of Natural Decay & Growth.

Linear Differential Equations of Second or Higher Order: Homogeneous, Non -Homogeneous, Differential Equations of second and higher order with constant coefficients with RHS terms of the type e^{ax}, Sin ax/cos ax, Polynomial in x, $e^{ax}V$ [V is sin ax or cos ax or polynomial in x], $x^m V$ [V is sin ax/ cos ax], method of Variation of parameters.

UNIT III:

Laplace Transforms

Laplace transforms of standard functions – Inverse Laplace - First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of Laplace transforms – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT IV:

Vector Calculus:

Vector Differentiation: Scalar and Vector point functions, Gradient of scalar point function, Directional derivatives – Divergence of a vector point function – Curl of a vector point function and their related properties.

Vector integration: Line integral - Work done – Vector potential function – Area, Surface and volume integrals. Green's theorem, Stoke's Theorem, and Gauss's Divergence Theorem (without proof), Applications of Green's , Stoke's and Gauss's Theorems.

Text Books:

1. T.K.V. Iyengar , Engineering Mathematics Volume-I , 12th Edition(2013) , S.Chand publication
2. E. Rukmangadachari & E. Keshava Reddy, Engineering Mathematics, Volume – I , 1st Edition (2010). Pearson Publisher

Reference Books:

1. Erwin Kreyszig , Advanced Engineering Mathematics, 10thEdition(2012), Wiley India.
2. B.S.Grewal ,Higher Engineering Mathematics, 42 Edition(2012), Khanna publishers .
3. Debashish Dutta ,Text Book of Engineering Mathematics, New Age International Publishers.
4. B.V.Ramana ,Higher Engineering Mathematics, Mc Graw Hill publishers(2008)

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(13HS106) ENVIRONMENTAL SCIENCE

Objectives: The student should be conversant with the evolution and the importance of environmental studies, various natural resources and the current threats to their sustainability, significance and protection of bio diversity and various forms of environmental degradation causes, effects and control measures of various pollutants and international conventions and protocols for the protection of environment.

UNIT-I:

Introduction to Environmental Science and Natural Resources:

Environment: Definition, scope, importance – need for public awareness. Renewable and non-Renewable resources. Natural resources and associated problems. Forest resources: Use –over exploitation- deforestation - case studies. Mining, dams - effects on forests and tribal people. Water resources: Use – over utilization of surface and ground water. Floods, drought, conflicts over water. Mineral resources: Use – exploitation - environmental effects of extracting and using mineral resources - case studies. Food resources: World food problems - changes caused by agriculture and overgrazing - effects of modern agriculture- fertilizer-pesticide problems. Water logging, salinity. Energy resources: Growing energy needs - renewable and non renewable energy sources. Use of alternate Energy sources, Impact of Energy use on Environment.

UNIT-II:

Ecosystems and Biodiversity:

Concept of an ecosystem: Structure and function of an ecosystem – producers, consumers, decomposers. Energy flow in the ecosystem. Ecological succession – food chains - food webs and ecological pyramids. Types of ecosystem: Introduction - characteristic features - forest ecosystem - grassland ecosystem - desert ecosystem - aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Introduction– definition, genetic - species –ecosystem diversity. Value of biodiversity: Consumptive use - productive use – social values – ethical values - aesthetic values. Biodiversity level: Global - national - local levels- India as a mega diversity nation- Hotspots of biodiversity. Threats to biodiversity: Habitat loss - poaching of wildlife – man wildlife conflicts – endangered and endemic species of India. Conservation of biodiversity: *In-situ* and e*x-situ* conservation of biodiversity**.**

UNIT-III

Environmental Pollution :

Pollution: Definition Cause, effects and control measures of –air pollution - water pollution - soil pollution - marine pollution - noise pollution - thermal pollution - nuclear hazards. Solid waste management: Causes - effects - control measures of Rural/Urban/Industrial waste management [with case study of any one type, e.g., power, fertilizer, tannin, leather, chemical, sugar]. Role of an individual in prevention of pollution. Population growth and Environment, Environment and human health. Effects of human activities (Urbanization, Transportation, Industrialization, Green revolution) on the Quality of Environment.

UNIT-IV

Social issues and the Environment:

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. Environment Protection Act. – Air (Prevention and Control of Pollution) Act.- Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Field Work:

Visit to a local area to document environment assets River/ forest grassland/ hill/mountain – Visit to a local polluted site-Urban/Rural / Industrial/ Agricultural Study of common plants, insects, birds – river, hill slopes, etc

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach. Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Environmental Studies by Benny Joseph, Mc. Graw Hill Publications.

Reference Books:

1. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
2. Comprehensive Environmental studies by J.P. Sharma, Laxmi publications.
3. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
4. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela – Printce hall of India Private limited.
5. Environmental Studies by Anindita Basak – Pearson education.

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(13HS107) COMPUTER PROGRAMMING

Objectives: The primary objective is to develop the under – graduate students of Engineering a level of competence in IT required for independent and effective skills for academics and industry needs.

UNIT – I:

Introduction to Computers and Programming:

Introduction computers- What is a computer?, block diagram of computer, Computer characteristics, hardware, software, types of programming languages.

Introduction to computer problem solving: introduction, the problem solving aspects , top-down design, implementation of algorithms, program verification, Flow charts.

Introduction to C Language - C Language Elements, General form of a C Program, Variable declarations, Data types, Executable statements, Expressions, Precedence and Associativity, Expression Evaluation, Operators and Expressions, Type Conversions, Data Input and Output, Preparing and running a complete C program.

UNIT – II:

Control Statements:

Decision Statements: If, if-else, nested if and switch Statements, Loop Control Statements - while, for, do-while Statements, Nested Loops, Other Related Statements - break, continue, goto.

Functions: Function prototype, definition and accessing, passing arguments to a function, Library Functions, Scope of a function, Storage Classes - Auto, Register, Static, Extern, Scope rules, Type qualifiers, Recursion - Recursive functions, C Preprocessor, header files.

UNIT – III:

Arrays and Pointers:

Arrays: Declaring and Referencing arrays, Array subscripts, Using for Loops for Sequential access, Using array elements as function arguments, operations on Multidimensional Arrays.

Sorting and Searching: Bubble Sort, Selection Sort, Quick sort, Merge Sort, Linear and Binary Search Methods

Pointers: Introduction, Features of Pointers, Pointer Declaration, Arithmetic Operations with Pointers, Pointers and Arrays, Pointers and Two-Dimensional Arrays, Array of Pointers, Pointers to Pointers, Void Pointers, Memory Allocation Functions, Pointer to Functions, Command- Line Arguments.

Strings: String Basics, String Handling Functions, String Comparison, Searching and sorting of strings.

UNIT – IV:

Structure and Union

Structure and Union: Introduction, Features of structure, Declaration and Initialization of Structure, Structure within Structure, Array of Structures, Pointer to Structure, self referential Structures, Structures and Functions, type def and Enumerated data types, Unions, Bit fields

Files: Introduction, Streams and file types, Steps for file operations, File I/O structures, Read and Write, register variables and bitwise operations, File Status functions (error handling).

Text Books:

1. Byron S Gottfried, Jitender Kumar Chabra, Programming with C, , Third Edition, McGraHill Pvt. Ltd.
2. Jeri R Hanly, Elliot B. Koffman, Ashok Kamthane, A. Ananda Rao, Programming in C and data structures, Pearson Education

Reference Books:

1. R. G. Dromey, How to Solve it by Computer, Person Education,2008.
2. B.A.Forouzan and R.F. Gilberg, C Programming & Data Structures, Third Edition, Cengage Learning,2000.
3. Stephen G. Kochan,Programming in C –III Edition, Pearson Educataion,2004.
4. J.A. Jones & K. Harrow ,C Programming with problem solving, Dreamtech Press
5. Harry H. Cheng,C for engineers and scientists an interpretive approach, , McGraHill International Pvt. Ltd
6. E.Balagurusamy, C Programming & Data Structures, TMH,2009.

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(13HS108) ENGINEERING MECHANICS

Objectives: The course is aimed at developing the basic skills of Civil Engineering students that are imperative for effective understanding of Civil Engineering subjects. The topics introduced will serve as basic tools for specialized studies in civil engineering.

UNIT – I:

Basics of Engineering Mechanics: Basic Concepts of Engineering Mechanics: Introduction to Engineering Mechanics – Scalar and Vector – Forces – Characteristics of a force – Definitions and examples of various types of force systems – Definition of resultant – Composition and resolution of forces – Moment of a force – Principles of moments of force – Couples – characteristics of a couple – on Transformations of a couple – Resolution of a force into a force and couple.

Resultants of Force System: Possible resultants of different types of force systems – Resultant of a concurrent, coplanar force system – Resultant of a non-concurrent coplanar force system – Resultant of a concurrent non-coplanar force system – Resultant of a parallel, non-coplanar force system – Resultant of a system of couples in space – Resultant of non-concurrent, non-coplanar, non-parallel force system – screw of Wrench.

Equilibrium of Forces: Free body diagrams – Equations of equilibrium for a concurrent coplanar force system – Equilibrium of Bodies acted on by two or three forces – Equilibrium of bodies acted on by non-concurrent coplanar force system – Equilibrium of bodies acted on by parallel, non-coplanar force system – Equilibrium of non-concurrent, non-coplanar non-parallel force system

UNIT – II:

Frictional Resistance & Applications of Friction:

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

Applications of Friction: 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:

Centroids and Centers of Gravity & Moments of Inertia:

Centroid and Centers of Gravity: Definition – Centroid and centers of gravity simple and composite bodies – Theorems of Pappus

Moments of Inertia: Definition – Parallel axis theorem for areas – Second moments of areas by integration – Radius of gyration of areas – Moments of inertia of composite areas – Parallel axis and parallel plane theorems for masses – Moments of inertia of masses by integration – Radius of gyration of mass – Moments of inertia of composite masses(Simple problems only)

UNIT – IV:

Kinematics: Introduction, Rectilinear kinematics: Continuous motion, General curvilinear motion, Curvilinear motion: Rectangular components, Motion of a projectile, curvilinear motion: Normal and tangential components, Absolute dependent motion analysis of two particles

Kinetics: Newton's law of motion, The equation of motion, Equation of motion for a system of particles, Equation of motion: Rectangular coordinates, Equation of motion: Normal and tangential Coordinates.

Text Books:

1. B. Bhattacharya, Engineering Mechanics- Oxford University Publications, 2009
2. S.S. Bhavikatti, Engineering Mechanics, New Age Internationals, 2nd edition, 2010

References Books:

1. A. K. Tayal, "Engineering Mechanics", Umesh Publications, 2005.
2. Ferdinand.L.Singer, Engineering Mechanics (Statics and Dynamics), Harper Row Publishers.2007.
3. Shames.I.H, Engineering Mechanics (Statics and Dynamics), Prentice – Hall of India- New Delhi, 2004.
4. Timoshenko.S.P and Young.D.H, Engineering Mechanics, McGraw Hill Book Co. Ltd.2003.
5. S.Temoshenko,D.H.Young and J.V.Rao,Engineering Mechanics,Revised 4th Edition,Tata-McGraw-Hill Publishing Company Limited,New Delhi,2007.

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(13HS109) ENGINEERING DRAWING

Objectives: Increase ability to communicate with people, Learn to take data and transform it into graphic drawings and Learn basic engineering drawing formats

UNIT – I:

Introduction to Engineering Drawing: Introduction to Drawing Instruments and their uses, Lettering, Types of Dimensioning, Division of a Line, Construction of Polygons, Inscribing of polygons, Describing of polygons.

Conic Sections

Ellipse: Eccentricity method, Oblong method, Parallelogram method, Arc's of Circles method and Concentric Circles method.

Parabola: Eccentricity method, Rectangle method, Tangent method, Parallelogram method.

Hyperbola: Eccentricity method, Rectangular hyperbola, Asymptotes method, Two branches of Hyperbola (Arc's of Circles method),Abscissa- Ordinate- method.

Cycloids: General Cycloid, Epi-Cycloid, Hypo-Cycloid.

UNIT – II:

Projections of Points, Straight Lines, Planes:

Points: Introduction to Orthographic Projections, Describing of quadrants , First and Third angle projection – Position of points in 4 quadrants.

Straight Lines: Lines parallel to both the principal planes, perpendicular to one plane and parallel to another plane, lines inclined to one plane, lines inclined to both the planes, finding true lengths, true inclinations.

Planes: Projection of regular plane surfaces, planes parallel to one plane, planes inclined to one plane and inclined to both the planes.

UNIT– III:

Projection of Solids, Sections and Development of Solids:

Solids: Positions of regular solids(prism, cylinder, pyramid and cone) – Projection of Solids – Axis perpendicular to one plane and parallel to another plane, inclined to one plane and inclined to both the planes, Axis parallel to both the Principal planes.

Section of Solids: Section Planes and Sectional views of Right Regular Solids–Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

Development of Solids: Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid, Cone and their Sectional parts.

UNIT – IV:

ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS

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

Orthographic Projections – Conversion of pictorial views into orthographic views

Text Books:

1. N.D. Bhat, Engineering Drawing, Charotar Publishers, 52nd Revised and Enlarged : 2013
2. K.L. Narayana, P. Khanniah, Engineering Drawing, Publisher, Scitech

Reference Books:

1. Venugopal, K., A Textbook of Engineering Graphics , New age Publishers,2009
2. Venkata Reddy, Engineering Drawing, B.S.Publishers ,2009
3. Basant Agrawal, C M Agrawal ,Engineering Drawing ,2013
3. V.Ramesh Babu, Engineering Drawing .2009
4. Shah and Rana, 2/e, Engineering Drawing, Pearson education.2013

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(13HS110) COMPUTER PROGRAMMING LAB

Objectives:

- To make the student learn a programming language.
- To teach the student to write programs in C to solve the problems.
- To introduce the student to simple linear data structures such as lists, stacks, queues.

Recommended Systems/Software Requirements:
Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE-1:
a) Write a C program to evaluate area of triangle (sqrt(s(s-a)(s-b)(s-c).
b) Write a C program to swap 2 numbers without using temporary variable.
c) Write a C program to print Sum of n natural numbers.
d) Programs on Expressions

EXERCISE-2:
a) Write a C program to calculate the following Sum:
Sum=1-x2/2! +x4/4!-x6/6!+x8/8!-x10/10!
b) Write a C program to find the roots of a quadratic equation.
c) Write a C program to print prime Numbers up to n numbers

EXERCISE-3:
a) Write a C program to find factorial of a number using while, do-while, for loops
b) Write a C program to determine if the given Number is a palindrome or not
c) Write a C program to determine if the given Number is a Armstrong or not

EXERCISE-4:
a) Write a program on matrices
i) Addition ii) Subtraction iii) Multiplication iv) Transpose
v) Sum of diagonal elements vi) Summing row wise and column wise

EXERCISE-5:
Programs on sorting and searching

EXERCISE-6:
a) Write a program to implement call by value and call by reference
b) Write a C program to print Fibonacci series using recursion and iteratively
c) Write a C program to find factorial of a number using recursion and iteratively

EXERCISE-7:
a) Write a C program to sort 5 city names in alphabetical order
b) Write a C program to determine if the given string is a palindrome or not.
c) Write a C program to implement string handling functions

EXERCISE-8:
a) Write a C program to print address of variable
b) Write a C program print the element of array using pointers

EXERCISE-9:
a) write a c program to find the total salary of employee and salary of employee details
b) write a C program to pass structure as an arguments to function and calculate total marks of 5 subjects

EXERCISE-10:
a) Write a C program to write and read data to and from files
b) Write a C program which copies one file to another.
c) Write a C program to reverse the first n characters in a file.

EXERCISE-11:
Programs on command line arguments

EXERCISE-12:
Programs on self referencing

Reference Books:
1. M.Cooper, The Spirit of C, an introduction to modern programming, Jaico Publishing House.
2. K.R. Venugopal and S.R. Prasad, Mastering C, TMH Publications,2006.
3. V. Rajaraman, Computer Basics and C Programming, PHI Publications.

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(13HS111) ENGINEERING WORKSHOP AND I.T. WORKSHOP

ENGINEERING WORKSHOP

Objectives: The Engineering Workshop for engineers is a training lab course. It imparts the required knowledge about producing the Products particular joining methods, manufacturing methods among the students through which they will get an idea about shop floor level, a manufacturing section in industry.

1: Trades for Exercises:

(a) Carpentry Shop

1. Cross Lap Joint
2. Mortise and Tenon Joint

(b) Fitting Shop

1. Square Fitting
2. V Fitting

(c) Sheet Metal Shop

1.3-Sided Tray (Trapezoidal Tray)
2. Cylinder (Circular Tin)

(d) House Wiring

1. Wiring for two lamps (bulbs) with independent switch controls with or without looping
2. Wiring for stair case lamp.

(e) Foundry

1. Single Piece Pattern
2. Double Piece Pattern.

(f) Welding

1. Lap Joint
2. T - Joint

2: Trades for Demonstration

i. Machine Shop (Lathe Machine, Grinding Machine and Drilling Machine)
ii. Metal Cutting
iii. Plumbing

In addition to the above, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, plastics, steels, meters, gauges, equipment, first-aid and shop safety shall be demonstrated through charts, layouts, figures, circuits, CD or DVD.

Reference Books:

1. Engineering Work shop practice, V. Ramesh Babu, VRB Publishers Private Limited, 2009
2. Work shop Manual, P.Kannaiah and K.L.Narayana, SciTech Publishers, 2009
3. Workshop Practice Manual, K. Venkata Reddy, BS Publications,

I.T. WORKSHOP

Objectives: The IT Workshop for engineers is a training lab course. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. The students should work on a working PC (PIV or higher)to disassemble and assemble back to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.

CHAPTER – I: PC Hardware

Task – 1:

Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor

Task – 2:

Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video shall be given as part of the course content

Task – 3:

Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva

Task – 4:

Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Task – 5:

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

CHAPTER - II: Word Processor

Task – 1:

Introduction to Ms Word, importance of Word as Word Processor, overview of toolbars, saving, accessing files, using help and resources.

Task – 2:

To create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

CHAPTER –III: Spread Sheets

Task –1:

The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task –2:

Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task –3:

Create student marks list for 10 students using for the formulas

CHAPTER –IV: Presentation

Task –1:

Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Powerpoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Task –2:

Second Exercise helps students in making their presentations interactive. Topic covered during this Exercise includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

CHAPTER – V: Internet & World Wide Web

Task –1:

Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task –2:

Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.

Task –3:

Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated by the student to the satisfaction of instructors.

Task – 4:

Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an antivirus software, configure their personal firewall and windows update on their computer.

Text Books:

1. ITL Education Solutions limited, Introduction to Information Technology, Pearson Education,2005.
2. Peter Norton, Introduction to Computers, 6/e Mc Graw Hill

Reference Books:

1. Leslie Lamport, LaTeX Companion –PHI/Pearson.
2. Scott Muller QUE, Upgrading and Repairing, PC's 18th e, Pearson Education,2007.
3. Vikas Gupta, Comdex Information Technology course tool kit, WILEY Dreamtech
4. David Anfinson and Ken Quamme. IT Essentials PC Hardware and Software Companion Guide, Third Edition by– CISCO Press, Pearson Education,2008.

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I B.Tech (CE)	L	T	P	[C]
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(13HS112) ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LAB

Objectives: Educate the theoretical concepts experimentally.

ENGINEERING PHYSICS LAB

1. Dispersive power of the prism – Spectrometer.
2. Determination of wavelength of given source- Spectrometer-Normal Incidence Method.
3. Determination of wavelength of a laser source - Diffraction Grating.
4. Determination of particle size by using a laser source.
5. Newton's Rings.
6. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
7. Numerical aperture of an optical fiber.
8. B – H Curve.
9. Energy gap of a material of p-n junction
10. Determination of rigidity modulus of a wire material – Torsional pendulum
11. Melde's experiment – Transverse & Longitudinal modes.
12. Hall Effect

ENGINEERING CHEMISTRY LAB

1. Preparation of Standard Potassium Dichromate and Estimation of Ferrous Iron.
2. Preparation of Standard Potassium Dichromate and Estimation of Copper, by Iodometry.
3. Preparation of Standard EDTA solution and Estimation of Hardness of Water.
4. Determination of Alkanity of water.
5. Preparation of Standard EDTA and Estimation of Copper
6. Determination of strength of the given Strong acid and weak acid against standard strong base solution by Conductometric titration
7. Determination of viscosity of the oils through Redwood viscometer (i) and (ii)
8. Flash point and Fire point apparatus.
9. Estimation of dissolved oxygen through Winklers method.
10. Preparation of phenol-formaldehyde resin (Bakelite)
11. Determination of Chlorine in Bleching powder and Iodine in Iodised salt.
12. Estimation of Chloride ion using potassium chromate indicator by mhor's method.

Reference Books:

1. J. Mendham et al ,Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition, 2012, Pearson Education,.
2. K.B.Chandra Sekhar, G.V. Subba Reddy and K.N.Jayaveera, Chemistry Practical – Lab Manual ,SM Publications, 3rd Edition, 2012Hyderabad.
3. Vogel's Book of Quantitative Inorganic Analysis, ELBS Edition.

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I B.Tech (CE)	L	T	P	[C]
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(13HS113) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

Objectives: To equip students with effective speaking and listening skills in English, help them develop the soft skills and people skills which will make them to excel in their jobs and enhance to students' performs at placement interviews

UNIT – I:
Activity– 1: Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
Activity– 2: Situational Dialogues (Giving Directions etc.)

UNIT – II:
Activity– 3: Speaking on the mobiles and telephone conversation
Activity– 4: Role Play
Activity– 5: 'Just A Minute' Sessions (JAM).

UNIT – III:
Activity– 6: Describing Objects / Situations / People in spoken and written formats.
Activity– 7: Information Transfer

UNIT – IV:
Activity– 8: Debate & Group Discussion.
Activity– 9: Reading Comprehension

Reference:

1. Daniel Jones, English Pronouncing Dictionary, Current Edition with CD.
2. R. K. Bansal and J. B. Harrison, Spoken English, Orient Longman 2006 Edn.
3. Krishna Mohan & NP Singh, Speaking English Effectively, (Macmillan)
4. J. Sethi, Kamlesh Sadanand & D.V. Jindal, A Practical Course in English Pronunciation, (with two Audio cassettes), Prentice-Hall of India Pvt. Ltd., New Delhi.
5. Dr Shalini Verma , Body Language- Your Success Mantra , S.Chand & Co, 2008
6. English Dictionary for Advanced Learners, (with CD) International edn. Macmillan 2009

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	3	0	0	[3]

(13HS116) MATHEMATICS-II

Objectives: The course is aimed at developing the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many engineering fields.

UNIT – I:

Matrix Algebra:

Rank of a matrix – Normal form, Echelon form – Inverse of a matrix using elementary operations – Consistency of system of Linear equations (Homogenous and Non-homogeneous) Hermitian & Skew Hermitian- unitary matrices and their properties. Eigen Values and Eigen Vectors (Real and Complex Matrices) Cayley- Hamilton theorem and its applications. Diagonalization of a matrix – Reduction of a quadratic form to canonical form by orthogonal transformation. Norm of a matrix – Euclidian and Infinite norms.

UNIT – II:

Numerical Analysis:

Numerical solutions of algebraic and transcendental equations by Bisection – Iteration and Newton – Raphson methods,. Forward, backward differences, Interpolation - Newton's forward and backward interpolation formulae, Lagrange interpolation, Numerical differentiation at the tabulated points with forward and backward differences. Numerical Integration with Trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule.

UNIT – III:

Numerical Solutions of Ordinary Differential Equations:

Numerical Solutions of ODEs – solution by Taylor series method, Euler's method, Picard's Method, Modified Euler's method, Runge-Kutta method of 2^{nd} & 4^{th} orders

UNIT IV – Fourier Series:

Expansion of a function in Fourier series for a given range – Half range sine and cosine expansions. Complex form of Fourier series – Fourier transformation – sine and cosine transformations – simple illustrations.

Z-Transforms: Inverse Z-transforms-Damping Rule and shifting Rule, initial and final value theorems – Convolution theorem.

Text Books:

1. T.K.V. Iyengar ,Mathematical Methods , 8th Edition(2013) ,S. Chand publication.
2. E. Rukmangadachari & E. Keshava Reddy, Engineering Mathematics, Volume - II, 1st Edition (2010),Pearson Publisher.

Reference Books:

1. B.S.Grewal ,Higher Engineering Mathematics, 42 Edition(2012),Khanna publishers.
2. B.V.Ramana , Higher Engineering Mathematics, Mc Graw Hill publishers(2008).
3. S.S. Sastry ,Introductory Methods of Numerical Analysis, 5th Edition(2012), PHI publisher .
4. Erwin Kreyszig,Advanced Engineering Mathematics, 10th Edition(2013),Wiley India.

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2	0	0	[2]

(13HS120) PROFESSIONAL ETHICS AND HUMAN VALUES

Objectives:

- To create an awareness on Engineering Ethics and Human Values
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others.

UNIT-I:

Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT-II:

Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT-III:

Engineering as Social Experimentation: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

UNIT-IV:

Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

Text Books:

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

Reference Books:

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

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(13CE301) BUILDING MATERIALS, PLANNING AND CONSTRUCTION

Objectives: To give the students a basic idea about the construction materials, building components and to introduce component methodologies. And also provides the knowledge of building bylaws, registration, planning of various types of buildings.

UNIT – I:

Structural Clay products: Bricks-classification; characteristics of good brick; Ingredients of good brick earth – functions of various ingredients; Harmful ingredients in brick earth; Manufacturing of bricks - clamp burning and kiln (only Hoffman's kiln) burning; defects in bricks; tests for bricks; Tiles- Characteristics of good tile; Types of tiles.

Stones: properties of building stones – relation to their structural requirements; classification of stones; quarrying of stones– precautions in blasting; dressing of stone; Characteristics of Good Building Stone.

Timber: structure of timber; characteristics of timber; seasoning of timber; Defects in timber; Decay of timber; Preservation of timber; fire resistance of timber; properties of wood; classification of timber.

UNIT – II:

Other Materials: Ferrous Metals: Structures of Ferrous Metal; iron, Pig iron, Cast Iron, Wrought Iron, Steel- composition, properties and uses; rolled steel section; reinforcing steel bars; rusting and corrosion; tensile testing of steel. Non Ferrous Metals: Aluminum, Copper- composition, properties and uses. Glass: constituents, commercial forms, glass wool. Paints: composition; covering power of paints; painting plastered surfaces, wood surfaces, metal surfaces; enamel; distemper; varnish.

Stone & Brick Masonry: Masonry-terms used in masonry; classification of stone masonry; supervision of stone masonry construction. Brick masonry- terminology; bonds in brick work; bond at connections; supervision of brick work; defects in brick masonry; thickness of a brick wall; comparison of brick and stone masonry.

UNIT – III:

Building components-I: Walls: Types of walls; load bearing wall; partition walls-brick partitions, concrete partitions, glass partitions, timber partitions. Floors: components of floor; selection of flooring material; cement concrete flooring; terrazzo, mosaic, marble and tiled flooring. Roofs: requirements of a roof; types of roofs; pitched roofs-basic elements; types of pitched roofs; king post truss; queen post truss.

Building components-II: Lintels and Arches: lintels-classifications; RCC lintels; Arch-terms used; classification of arches. Stairs: Technical terms; requirements of good stair; dimensions of a step; classification of stairs. Doors and windows: location of doors and windows; technical terms; size of doors; door frames; types of doors; windows-types.

Finishing's: plastering: Terminology used in plastering work; types of plaster finishes; defects in plastering. Pointing-methods. Damp proofing: causes of dampness; methods of damp proofing; materials used in damp proofing; D.P.C. treatment in buildings; Termite proofing; introduction; anti termite treatment-site preparation, soil treatment. Shoring, underpinning and scaffolding.

UNIT – IV:

Planning of Buildings: Types of buildings, types of residential buildings, site selection for residential building, orientation of buildings; aspect; prospect; privacy; furniture requirement;grouping;circulation;sanitation;lighting;ventilation;cleanliness;flexibility;elegancy; Economy; practical considerations.

Building byelaws and Regulations: Introduction- Terminology ;Objectives of building byelaws; Minimum plot sizes; Open space requirements ;Plinth area, floor area, carpet area; Floor area ratio (FAR), Floor space Index (FSI) ;areas for different units; Principles underlying building byelaws ; built up area limitations – Height of Buildings ,Wall thickness, lighting and ventilation requirement, safety from fire, drainage and sanitation; applicability of the bye-laws.

Project Networking: Project management; Methods of planning and programming; Bar chart; Elements of network planning; PERT and CPM Networks; computation of times and floats – their significance.

Text Books:

1. S K Duggal, Building material, New Age International Publishers; Second Edition,
2. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain ,Building Construction - Laxmi Publications (P) ltd., New Delhi, 10th edition,2009.
3. Yashwant S. Sane, Planning and Designing Buildings ,Allies Book Stall.1964

Reference Books:

1. Dr N. Kumaraswamy ,A.Koteswara Rao Building Planning & Drawing –Chorotar publishing house, 7th Edition: 2013
2. S. C. Rangwala; Engineering Materials ,Charotar Publishing House, 40th Revised and Enlarged : 2013
3. P.C. Varghese, Building Construction, Prentice-Hall of India private Ltd, New Delhi,2013
4 P.C. Varghese, . Building materials , Prentice-Hall of India private Ltd, New Delhi,2012
5. Civil Engg. Materials by Technical Teachers' Training Institute, Chandigarh, Tata-Mc Graw-Hill Publishing Company Ltd., New Delhi.
6. Materials of construction by R.C. Smith, McGraw-Hill Company, New York.

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(13CE302) STRENGTH OF MATERIALS-I

Objectives: This subject is useful for a detailed study of stresses, strains and their effects along with some suitable protective measures for the safe working condition. This knowledge is very essential for an engineer to enable him in designing all types of structures and machines.

UNIT-I:

Simple Stresses and Strains: Types of stresses and strains, Hooke's law, stress-strain diagram for mild steel, Working stress - allowable stress and factor of safety, Elastic constants and relation between them - Poisson's ratio - volumetric strains, Analysis of - Bars of varying section - composite bars –Temperature / Thermal stresses, Elongation of a bar due to its own weight.

Analysis of Trusses: Definition of truss, Types of trusses, Analysis of trusses using method of joints, Method of sections for vertical loads, horizontal loads, inclined loads.

UNIT- II:

Shear Force and Bending Moment Diagrams: Definition of beam-Types of beams-Types of loads, Shear force (S.F) and Bending moment (B.M) - S.F and B.M diagrams for cantilever, simply supported and over hanging beams subjected to point loads, uniformly distributed load (U.D.L), uniformly varying loads (U.V.L) and combination of these loads, Point of contra flexure, Relation between load, shear force, and bending moment.

UNIT- III:

Flexural Stresses: Flexural stresses, Theory of simple bending- assumptions, Derivation of bending equation, Neutral axis and Moment of Resistance, Bending stresses in symmetrical sections, Section modulus for various shapes or beam sections (rectangular, circular, solid and hollow, I, T, angle and channel sections) .

Shear Stresses: Introduction, Shear stress at a section (derivation of equation), Shear stress distribution for different sections (rectangular, circular, solid and hollow, I, T, angle sections.

UNIT- IV:

Energy Theorems and Energy Principles: Introduction – Principle of super position, Maxwell Reciprocal theorem-– Betti's theorem, Castigliano's theorems I & II – The Muller –Breslau Principle.

Torsion: Theory of pure torsion – Derivation of Torsion equation: $T/J = q/r = Ne/ l$, Assumptions made in the theory. Theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts- Combined bending and torsion.

Text Books:

1. R. K. Bansal, Strength of materials ,Lakshmi Publications, 5th Edition, 2012.
2. R. K. Rajput, Strength of Materials ,S. Chand and Co., New delhi.1999
3. S. S. Bhavikatti, Strength of Materials I & II ,New Age Publications,2012

Reference books:

1. Strength of Materials and mechanics of solids Vol-1 & 2 by B.C. Puunmia, Laxmi Publications, New Delhi,2013
2. Introduction to Engg mechanics of solids by Egor Popov.
3. Theory of structures by Ramamuratam,jain book depot , New Delhi
4. James M. Gere, Stephen Timoshenko, Mechanics of materials, CBS Publisher ,2004.

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(13CE303) FLUID MECHANICS

Objectives: This course gives an introduction to the fundamentals of fluid flow and its behavior so as to equip the students to learn related subjects and its application in the day to day life in a very effective manner.

UNIT – I:

Fluid Properties: Dimensions and units – physical properties of fluids- Mass Density, Specific Weight, Specific Gravity, Specific Volume, Relative Density, Vapor pressure ;viscosity - Newton's Law of Viscosity, Dynamic or Absolute Viscosity, Kinematic Viscosity, Newtonian and non Newtonian fluids, Rheological Diagram; surface tension and capillarity.

Pressure and its Measurement: Fluid Pressure at a Point; Pascal's law; Hydrostatic law; Atmospheric, Absolute and gauge pressure; Hydrostatic paradox, Pressure measurement-manometers: Simple, differential and Micro Manometers.

Hydrostatic Forces on Surfaces: Total Pressure and Centre of Pressure: on Horizontal Plane Surface; Vertical Plane Surface; Inclined Plane Surface and Curved Surfaces.

UNIT-II:

Buoyancy: Buoyancy; Buoyant Force and Centre of Buoyancy, Stability of submerged bodies and floating bodies; Metacentre and Metacentric height, analytical method for Metacentric height.

Kinematics of Fluid Motion: Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; Irrotational and rotational flows; Streamline; Path line; Streak line; Equation for acceleration; Convective acceleration; Local acceleration; Continuity equation; Velocity potential and stream function; Flow net; Vortex flow – free vortex and forced vertex flow.

Dynamics of Fluid Flow: Forces acting on a Fluid in Motion; Euler's equation of motion; .Bernoulli's equation ; Energy correction factor; Momentum principle; Force exerted on a pipe bend.

UNIT-III:

Flow Measurements in Pipes: Discharge through Venturi Meter; Discharge through Orifice Meter; Discharge through flow nozzle; Measurement of velocity by Pitot tube, Pitot - static tube.

Flow through Orifices and Mouthpieces: Flow through Orifices: Classification of Orifices; Determination of coefficients for an Orifice Flow through large rectangular Orifice; Flow through submerged Orifice – fully sub-merged and partially sub-merged. Classification of Mouthpieces; Flow through external and internal cylindrical Mouthpiece

Flow Over Notches & Weirs: Classification of Notches and Weirs; Flow through rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Cipolletti weir, Broad crested weir.

UNIT-IV:

Analysis of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length; Hydraulic power transmission through a pipe; Siphon; Pipes in series, parallel & branched pipes.

Laminar Flow: Reynolds's experiment; Characteristics of laminar flow; Steady laminar flow through a circular pipe (Hazen poiseuille equation).

Turbulent Flow in Pipes: Characteristics of turbulent flow, Prandtl's mixing length theory, Hydro dynamically smooth and rough boundaries, Velocity distribution, Friction factor for pipe flow, Variation of friction factor with Reynolds number- Moody's chart.

Text Books:

1. P. N. Modi & S. N. Seth; Hydraulics & Fluid Mechanics , Standard Book house, New Delhi,17th edition 2011
2. Dr. R. K. Bansal; Fluid Mechanics & Hydraulic Machines ,Laxmi Publications, New Delhi.9th edition,2010

Reference Books:

1. A. K. Jain; Fluid Mechanics , Khanna Publishers, Delhi
2. Rajput, Fluid mechanics and fluid machines , S.Chand &Co.
3. D.S. Kumar Kataria & Sons, Fluid Mechanics & Fluid Power Engineering , D.S. Kumar Kataria & Sons.
4. K R Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines , Standard Publishers
5. Kumar K.L., Engineering Fluid Mechanics, Eurasia Publishing House (P) Ltd., New Delhi,
6 Streeter and wyile, . Fluid Mechanics, TATA Mc Grawhill Publications

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(13CE304) SURVEYING-I

Objectives: To ensure that the student develops knowledge of the basic and conventional surveying instruments, principles behind them, working of the instruments, plotting of the area from the field measurements.

UNIT – I:

Basic Concepts: Surveying – History; Definition; primary divisions, Classification, Principles of surveying Plan and map; Basic Measurements; Instruments and Basic methods; units of measurement, Scales used for Maps and plans, Duties of a surveyor. Errors: Accuracy and Precision Sources and types of errors, theory of Probability, Rounding of numbers.

Chain Surveying: Instruments for chaining, Ranging out, chaining a line on a flat ground; Chaining on an uneven or a sloping ground; Chain & Tape corrections; Degree of accuracy. Principles of chain surveying; Basic definitions; Well-Conditioned Triangle, Field book, Field work; Offsets, Cross Staff survey; obstacles in chain survey-problems, Conventional signs.

UNIT-II:

Compass Survey: Introduction, Bearings and angles, Designation of bearings, Conversion of bearings from one system to the other, fore bearing and back bearing, , Calculation of bearing from angles, Theory of Magnetic compass (i.e. Prismatic compass), Temporary adjustments of compass-Magnetic Declination, Local attraction-Related Problems-Errors in compass survey.

Plane Table Surveying: Introduction, Accessories, Working operations, Methods of plane tabling, three point problem-Mechanical method -Graphical method, Two point problem, Errors in plane tabling.

UNIT-III:

Leveling: Introduction, basic definitions, methods of leveling, leveling instruments: dumpy level, leveling staff, Temporary adjustments of dumpy level, theory of simple and differential leveling, Level field book, Classification of direct leveling methods, Reciprocal leveling, Profile leveling and Cross sectioning, Curvature and Refraction, Difficulties in leveling, errors in leveling, Degree of Precision.

Contouring: Introduction, contour interval, Characteristics of contours Methods of locating contours - Direct and indirect methods; Interpolation and sketching of contours, Contour gradient-Uses of contour maps.

UNIT-IV:

Theodolite: Vernier Thedolite: Basic definitions; Fundamental lines and desired relations; Temporary adjustments; Measurement of a horizontal angle; Repetition and Reiteration methods of horizontal angle measurement. Measurement of vertical angle; Sources of errors in Theodolite survey.

Traverse Surveying: Introduction, Selection and marking of traverse stations, methods of traversing, traversing by free needle and fast needle method, traversing by direct observation of angles, checks in closed traverse, closing error, methods of balancing the traverse, Gale's traverse table, Omitted measurements.

Text Books:

1. Dr. K. R. Arora; Surveying Vol. 1, Standard Book House;2008, Surveying Vol. 2, Rajsons publications 10th edition 2010
2. Surveying Vol-I&II by B.C. Punmia ,Laxmi Publications,15th edition,2005

Reference Books:

1. AM Chandra, Plane Surveying , New Age International (P) Ltd.
2. S K Roy, Fundamentals of Surveying ,Prentice- Hall of India Private Ltd.
3. S.K. Duggal. Surveying Vol. 1and 2 , Tata Mc. Graw Hill Publishing Co.
4. Kanetkar T.P., and Kulkarni ,Surveying and Levelling by Vols. I and II, United Book Corporation, Pune, 1994.
5. Shahani, P.B., Text book of Surveying, Vol.I & II, Oxford & IBH Publications, 1998
6. S K Roy, . Fundamentals of Surveying, Prentice- Hall of India Private Ltd.

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(13CE305) ENGINEERING GEOLOGY

Objectives: At the end of course the student shall be able to understand about geological formations, classification and morphology of rocks, and the importance of study of geology for civil engineers with regards to founding structures like dams, bridges, buildings, etc. The student shall also be able to appreciate the importance of geological formation in causing earth quakes and landslides.

UNIT – I:

Introduction: Importance of geology from Civil Engineering point of view, Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs.

Weathering of Rocks: Its effects over properties of rocks-importance of weathering with reference to dams, reservoirs and tunnels weathering of common rocks like "Granite".

Geology of Dams and Reservoirs: Types of dams and bearing Geology of site in their selection-Geological Considerations in selection of a dam site, Analysis of dam failures of the past, Factor's contributing to the success of a reservoir, Geological factors influencing water Lightness and life of reservoirs.

Tunnels: Purposes of tunneling- effects of tunneling on the ground- Role of Geological considerations in tunneling over break and lining in tunnels.

UNIT – II:

Mineralogy: Definition of mineral- Importance of study of minerals- Different methods of study of minerals- Advantages of study of minerals by physical properties- Role of study of physical properties of minerals in the identification of minerals, Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kainite, Garnet, Talc, Calcite, Study of other common economic minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite and Bauxite.

Petrology: Definition of rock, Geological classification of rocks into igneous, sedimentary and metamorphic rocks,Dykes and sills, common structures and textures of igneous, sedimentary and metamorphic rocks-Their distinguishing features, Megascopic study of granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Lime stone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT – III:

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults Un conformities, and joints – their important types, Their importance Insitu and drift soils, common types of soils- their origin and occurrence in India, Earth quakes- their causes and effects, shield areas and seismic belts, Seismic waves-Richter scale- precautions to be taken for building construction in seismic areas, Landslides- their causes and effect-measures to be taken to prevent their occurrence, Importance of study of ground water, earth quakes and landslides.

UNIT – IV:

GROUND WATER & GEOPHYSICAL STUDIES: Ground water, water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration, Importance of geophysical studies- principles of geophysical study by Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radio metric methods and Geothermal method, Special importance of Electrical resistivity methods and seismic refraction methods, Improvement of competence of sites by grouting etc.

Text Books:

1. K.V.G.K Gokhale, Principals of Engineering Geology – B.S publications,2010
2. N. Chennkesavulu, Engineering Geology , Mc-Millian, India Ltd. 2005
3. D.Venkata Reddy, Engineering Geology ,Vikas Pubilcations, New Delhi,2nd Edition,2011

Reference Books:

1. Prabin Singh, Engineering geology .
2. F.G. Bell, Fundamental of Engineering Geology Butterworrths, Publications, New Delhi, 1992
3. Krynine &Judd, Priniciples of Engineering Geology &Geotecnics, CBS Publishers & Distribution,
4. Mukarjee, Engineering Geology , World Press.
5. Tony Waltham, Foundation of Engineering Geology , Special Indian Edition, CRC Press New Delhi.

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	0	0	3	[2]

(13CE306) STRENGTH OF MATERIALS LAB

Objectives: The experimental work involved in this laboratory should make the student understand the fundamental modes of loading of the structures and also make measurements of loads, displacements and strains. Relating these quantities, the student should be able to obtain the strength of material and stiffness properties of structural elements.

List of Exercises / Tests:

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

List of Major Equipment:

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

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(13CE307) ENGINEERING GEOLOGY LAB

Objectives: The experimental work involved in this laboratory should make the student understand the fundamental modes of Rocks , minerals & geological models and also to make them to understand & study the geological maps and satellite images.

1 .Study of Survey of India Topographical Maps
2. Study of Satellite Imageries
3. Study of Minerals by their Physical Properties
4. Identification and Textural Study of Rocks
6. Determination of Porosity in Rocks
7. Determination of Compressive Strength of Rocks
8. Determination of Slake and Durability of Rocks
9. Study of Structural Problems
10. Study of Geological Maps and their Cross-section
11. Study of Structural Models
12. Study of Tunnel Models

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	0	0	3	[2]

(13CE308) SURVEY FIELD WORK-I

Objectives: The experimental work involved in this laboratory will wake the student to understand the fundamental concepts and posses knowledge about field survey techniques.

LIST OF EXERCISES:

A) Chain Survey:
1. Study of chains and its accessories - Aligning, Ranging and Chaining
2. Cross staff survey and plotting
3. Chaining across obstacles and plotting

B) Compass Survey:
4. Study of prismatic compass – Measurement of bearings of lines
5. Determination of distance between two inaccessible points with compass
6. Compass traversing (closed traverse) and plotting

C) Plane Table Survey:
7. Study of plane table and its accessories
8. Radiation and Intersection methods by plane table survey
9. Plane table traversing
10. Resection - Two point and three point problems

D) Leveling:
11. Study of Dumpy level/Auto level and leveling staff
12. Fly leveling (differential leveling)
13. Longitudinal and cross-sectioning of a road profile and plotting.
14. Contouring exercise

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	3	0	0	[3]

(13HS117) MATHEMATICS-III

Objectives: The Subject is aimed at developing the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many engineering fields.

UNIT – I:
Probability:
Sample space and events – The axioms of Probability – Some elementary theorems - Conditional probability – Baye's theorem

UNIT – II:
Random Variables and Probability Distributions:
Discrete and Continuous distributions – Distribution functions – Binomial, Poisson, and Normal distributions.
Population and samples - Sampling distribution of mean (with known and unknown variance), proportion, variances – Special Distributions: Student t - Distribution

Unit – III
Statistics:
Mean , Median , Mode and other measures of Central tendency – Dispersion or variation – The Range – The Mean Deviation – The Semi – interquartile Range - The 10 – 90 Percentile Range – The Standard Deviation – The Variance – Short Methods for computing the Standard Deviation – Properties of Standard Deviation – Moments – Skewness and Kurtosis

UNIT- IV:
Partial Differential Equations:
Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions - Method of Separation of variables, Solutions of Wave equation, Heat equation and two dimensional Laplace equation under initial and boundary conditions (both Cartesian and Polar forms)

Text Books:

1.B.S.Grewal ,Higher Engineering Mathematics, 42 Edition(2012),Khanna publishers.

Reference Books:

1. TKV Iyengar et al ,Probability and Statistics , S.Chnad Publications.
2. E. Rukmangadachari & E. Keshava Reddy, Engineering Mathematics, Volume - II, 1st Edition (2010) Pearson Publisher.
3. Erwin Kreyszig,Advanced Engineering, Mathematics, 10th Edition(2013),Wiley India.

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	3	0	0	[3]

(13CE401) ELEMENTS OF ELECTRICAL AND MECHANICAL ENGINEERING

(PART-A) ELECTRICAL TECHNOLOGY

Objectives: To understand the basic concepts of Electromagnetism, basics of D.C machines and their applications, single phase Transformers, Alternators & measuring instruments.

UNIT-I:

DC Machines: Working principle of DC machine as a generator and motor. Types and constructional feature. E.M.F equation of generator, relation between induced E.M.F and terminal voltage taking into account both brush drop as well drop due to armature reaction. Back E.M.F and its importance, torque equation of D.C motor. Types of D.C. motors- Characteristics and applications. Necessity of a starter for motor. Numerical problems on E.M.F Equation, back E.M.F & Torque Equation only.

Transformers: Principle of operation and construction and types of single phase transformers. E.M.F equation, power losses, efficiency and voltage regulation-numerical problems.

UNIT-II:

Alternators: Principle of operation, types and constructional features. E.M.F equation of alternator, regulation by synchronous impedance method – principle of operation of induction motor slip – torque characteristics – applications.

Instruments: Basic principles of indicating instruments – permanent magnet moving coil and moving iron instruments.

Text Books:

1. A.K. Theraja & B.L. Theraja,"Electrical Technology", S.Chand publishers, 25th edition, 2012.
2. M.S. Naidu & S. Kamakshaiah," Introduction to Electrical Engineering" –, TMH 15th edition 2008.

Reference Books:

1. D.C. Kulshreshtha "Basic Electrical Engineering'', TMH, 1st Edition 2009.
2. Rajendra Prasad, "Fundamentals of Electrical Engineering'', Prentice-Hall of India pvt. Ltd., second edition 2009.
3. E. Hughes; "Electrical Technology'', International students 9th Edition, Pearson, 2005.
4. J.B.Gupta, "Theory and performance of Electrical Machines", Khanna Publishers, 14th edition, 2010.

(PART-B) MECHANICAL TECHNOLOGY

Objectives: To understand the basic concepts of Electromagnetism, basics of D.C machines and their applications, single phase Transformers, Alternators & measuring instruments.
To understand the basic concepts of Welding processes, prime movers, reciprocating air composers & earth moving machinery.

UNIT –III:
Welding processes: interdiction to welding classification of welding processes oxyacetylene welding – equipment , welding fluxes and filler rods gas cutting interdiction to arc welding – manual metal arc welding submerged arc welding TIG and MIG processes soldering and brazing importance comparison and applications.
Description and working of steam engines and steam turbines (prime movers) impulse and reaction turbines description and working of I.C engines – 4 stroke and 2 stroke engines – comparison – gas turbines – closed and open type gas turbines.

UNIT –IV:
Reciprocating air composers – description and working of singal stage and multistage reciprocating air compressors – inter cooling transmission of power belt rope chain and gear drive simple problems.
Block diagram of a vapour compression refrigeration system names of common refrigerants basic principles of air conditioning room and general air conditioning system ducting different types of ventilation system
Earth moving machinery and mechanical handling equipment bull dozers power showels excavators concrete mixer – belt and bucket conveyers.

Text Books:

1. 1. A.K. Theraja & B.L. Theraja,"Electrical Technology", S.Chand publishers, 25th edition, 2012.
2. 2. M.S. Naidu & S. Kamakshaiah," Introduction to Electrical Engineering" , TMH 15th edition 2008.
3. Khurmi "Mechanical Technology"

Reference Books:

1. Kodandaraman C.P "Mechanical Technology"
2. Construction Planning; Equipment and Methods – Purify.

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(13CE402) STRENGTH OF MATERIALS-II

Objectives: This course is in continuation of Strength of Materials-I. Here in advanced topics like principal stresses & strains, theories of failure, Columns and struts & Direct and bending stresses are covered.

UNIT-I:

Principal Stresses and Strains: Principal stresses and principal planes, Methods of determining stresses on oblique section - Analytical method - Graphical method (Mohr's circle of stresses)

Theories of Failure: Maximum principal stress theory, Maximum principal strain theory, Maximum shear stress theory, Maximum strain energy theory, Maximum shear strain energy theory

Springs: Introduction, Types of springs, Deflection of close and open coiled helical springs under axial pull and axial couple, springs in series and parallel, Carriage or leaf springs

UNIT- II:

Columns and Struts: Introduction, Classification of Columns, Failure of a Column, Euler's theorem for long columns- assumptions- derivation of Euler's critical load formula for various end conditions, Equivalent length of a column, Slenderness ratio- Euler's critical stress- limitations of Euler's theorem, Rankine- Gordon formula-Long columns subjected to eccentric loading, Prof. Perry's formula.

Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment, Kernel of a section, Determination of stresses in the case of chimneys, retaining walls and dams, Conditions for stability, Stresses due to direct loading and bending moment about both axis.

UNIT- III:

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – Changes in dia, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders: Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

UNIT-IV:

Deflection of Beam 1: Introduction, Relation between curvature ,Slope & Deflection, Deflection curves, Differential equation for the elastic line of a beam - Double integration and Macaulay's methods.

Deflection of Beam 2: Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.DF.L. Uniformly varying load –Moment area method: Slope and deflection for Cantilever, simply supported & over hanging beam – Deflections of propped cantilevers for simple loading cases.

Text Books:

1. R.K. Bansal "Strength of Materials", Lakshmi Publications.
2. R. K. Rajput "Strength of Materials", S. Chand and Co., New delhi

Reference Books:

1. R. K. Rajput "Introduction to Mechanics of Solids"
2. Singer "Strength of Materials".

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(13CE403) HYDRAULICS AND HYDRAULIC MACHINERY

Objectives: The main objective of this course is to deal with the concepts of flow through open channels and their applications and the principles of hydraulic machines and hydraulic models.

UNIT- I:

Open Channel Flow – Uniform Flow: Introduction, Classification of flows, Types of channels; Flow analysis: The Chezy equation, Empirical formulae for the Chezy constant, Hydraulically efficient channel sections: Rectangular, Trapezoidal, Triangular and Circular channels; Velocity distribution; Energy and momentum correction factors. Application of Bernoullis equation to open channel flow.

Open Channel Flow – Non-Uniform Flow: Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; discharge curve, Different slope conditions; Channel transitions- Reduction in width of a rectangular channel, Raised bottom in a rectangular channel, venture flume, Momentum principle applied to open channel flow; Specific force; Specific force curve.

UNIT – II:

Open Channel Flow – Gradually Varied Flow: Introduction, Dynamic equation; Dynamic equation for GVF in wide Rectangular channel, classification of channel bottom slopes, Surface Profiles; Characteristics of surface profiles, Back water Curves and Draw down curves; Examples of various types of water surface profiles; Control section, Computation of surface profiles by single step method.

Open Channel Flow – Rapid Varied Flow: Hydraulic jump; Elements and characteristics of hydraulic jump; Hydraulic jump in rectangular channels, height and length of the jump, Energy loss in a hydraulic jump, Types of hydraulic jump; applications of hydraulic jump; Location of hydraulic jump,.

UNIT – III:

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for
work done and efficiency-Angular momentum principle, Torque and head transferred in roto dynamic machines.

Hydraulic Turbines-I: Introduction, head and efficiencies of hydraulic turbines, Classification of turbines; pelton wheel: parts, Velocity triangles, work done and efficiency, working proportions, design of pelton wheel. Radial flow reaction turbines: velocity triangles and work done for inward radial flow turbine, degree of reaction, discharge, speed ratio, flow ratio.

Hydraulic Turbines-II: Francis turbine: main components and working, work done and efficiencies, design proportions; design of Francis turbine runner. Kaplan turbine: main components and working, working proportions. Draft tube: theory and efficiency; specific speed, unit quantities, characteristic curves of hydraulic turbines. Cavitation: causes, effects.

UNIT – IV:

Centrifugal Pumps: Introduction, component parts and working of a centrifugal pump, work done by the impeller; heads, losses and efficiencies; minimum starting speed; Priming ;specific speed; limitation of suction lift, net positive suction head(NPSH);Performance and characteristic curves; Cavitation effects ;Multistage centrifugal pumps; troubles and remedies.

Dimensional Analysis and Similitude: Introduction, dimensions; Dimensional homogeneity; Methods of dimensional analysis- Rayleigh's method; Buckingham – Pi theorem; model analysis; similitude-types of similarities; Dimensionless numbers; Model laws ;Partially submerged objects; types of models; Scale effect.

Boundary Layer Theory & Drag and Lift: Boundary layer – concepts, Prandtl's contribution, Characteristics of boundary layer along a thin flat plate, laminar and turbulent Boundary layers, separation of BL. expression for drag and lift; Lift and Drag Coefficients; pressure drag and friction drag; Streamlined and bluff bodies.

Text Books:

1. P. N. Modi & S. N. Seth "Hydraulics & Fluid Mechanics", Standard Book house, New Delhi
2. Dr. R. K. Bansal "Fluid Mechanics & Hydraulic Machines" Laxmi Publications, New Delhi.

Reference Books:

1. K. Subramanya "Open channel flow", TMH Publishers
2. V.T.Chow "Open Channel flow", Mc.Graw Hill Book Company.
3. Ranga Raju "Elements of Open channel flow", Tata Mc.Graw Hill, Publications.
4. A. K. Jain "Fluid Mechanics", Khanna Publishers, Delhi
5. Rajput "Fluid mechanics and fluid Machines" by, S.Chand &Co.
6. Banga & Sharma "Hydraulic Machines", Khanna Publishers.

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(13CE404) SURVEYING-II

Objectives: At the end of the course the student will posses knowledge about computation of areas, Tachometric surveying, triangulation, EDM and remote sensing.

UNIT-I:

Computation of Areas and Volumes: methods of determining areas, areas by sub-division into triangles, areas from offsets to a base line: regular and irregular intervals, area by double meridian distances, area by co-ordinates. embankments and cutting for a level section, two level sections, three level section and multi level section, volume of earth work from contour plan, capacity of a reservoir , volume of barrow pits.

Minor Instruments: uses and working of the minor instruments: hand level, line ranger, optical square, abney level, clinometer, ceylon ghattracer, pantagraph, sextant and planimeter.

UNIT-II:

Trigonometric Leveling: Introduction; Determination of the level of the top of an object, When its base is accessible and When its base is not accessible; Determination of the height of the object when the two instrument stations are not in the same vertical plane; Axis signal correction; Difference in elevation by single observation and reciprocal observations.

Tacheometric Surveying: Definition, Advantages of Tacheometric surveying- Basic systems of tacheometric measurement , Principle of stadia measurements, Determination of constants K and C, Inclined sight with staff vertical; Inclined sight with staff normal to the line of sight, Movable hair method, Tangential method, Subtanse bar, Errors in Tacheometry.

UNIT-III:

Triangulation: Principles of triangulation, Uses of triangulation survey; Classification of triangulation; operations of triangulation survey; Signals and towers, Satellite station; Base line & Extension of the base line.

Curves: Simple curves–Definitions and Notations, designation of a curve, Elements of simple curves, location of tangent points, selection of peg interval, Methods of setting simple curves(based on equipment) – Rankines method, Two theodolite method. Compound curves – Elements of compound curve, setting out compound curve. Reverse curves – Elements of reverse curve, relationship between various elements.

UNIT-IV:

Electronic Distance Measurements: Introduction, Basic concepts-electromagnetic waves, basic definitions, phase of the wave ,units, types of waves; distance from measurement of transit time, Computing the distance from the phase differences, , EDM instruments, electronic theodolites, total station-models, fundamental measurements, recording, traversing, data retrieval.

Remote Sensing: Introduction, Principle of Remote sensing, EM Radiation and the atmosphere, interaction of EM radiation with earth's surface, remote sensing observation platforms, sensors, applications of remote sensing. Geographical Information System: Introduction and principle of Geographical Information System, components of GIS, applications.

Text Books:

1. Dr. K. R. Arora “Surveying Vol. 1 & II”, Standard Book House;
2. Dr. K. R. Arora “Surveying Vol-I&II”, Laxmi Publications

Reference books:

1. S.K. Duggal “Surveying Vol. 1and 2”, Tata Mc. Graw Hill Publishing Co.
2. Kanetkar T.P., and Kulkarni , Vols. I and II “Surveying and Levelling”, United Book Corporation, Pune, 1994.
3. Shahani, P.B “Text book of Surveying,., Vol.I & II”, Oxford & IBH Publications, 1998
4. P.A. Burrough “Principles of GIS for land resource assessment”, Clerendon Press, Oxford.
5. Mahajan, Santhos K. Dhanpat Rai & Sons “Advanced Surveying”, Nai Sarak, Delhi, 1987.
6. Lillesand,T.M.,and Kiefer R.W., John Wiley and Sons “Remote sensing and Image Interpretation”, New York, 1997

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(13CE405) CONCRETE TECHNOLOGY

Objectives: This course covers the fundamental concepts of classification, grading and testing of materials, mix design of and methods of concreting and also about special concretes

UNIT-I:

Cement: Manufacture of Portland cement by dry process, approximate oxide composition limits of OPC, Bogue's compounds, heat liberation from a setting cement, structure of hydrated cement, water requirements for hydration. Ordinary Portland cement, Rapid hardening cement, Sulphate resisting cement, Slag cement, Quick setting cement, Super sulphated cement, Portland pozzolana cement, air entraining cement, Coloured cement, expansive cement, High alumina cement.

Testing and Handling of Cement: Fineness of cement using sieve test and air-permeability method, Normal consistency and setting times using vicat apparatus, soundness test using Le-chatlier apparatus, Grades of cement as per IS specifications, physical and chemical requirements of OPC for different grades of cement, storage of cement in sheds and silos, Transportation of cement, Safety while handling cement, Uses of cement.

Aggregates: Classification of aggregates – Particle shape and texture – Bond, Strength & other mechanical properties of aggregates (i) Specific gravity (ii) Bulk density (iii) porosity (iv) Absorption (v) Moisture content – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse aggregate – Gap graded aggregate – Maximum aggregate size.

UNIT-II:

Water: Quality of water for mixing concrete, Tolerable concentrations of some impurities in mixing water, permissible limit for solids as per IS456-2000, use of sea water for mixing concrete.

Admixtures: General, plasticizers and super plasticizers – Dosage, mixing procedure, equipment, and effect of super plasticizes on the properties of hardened concrete, Retardors, accelerators. Air-entraining admixtures, factors affecting amount of air-entrainment, effect of air entrainment on the properties of concrete, fly ash, effect of fly ash on fresh and hardened Concrete, high volume fly ash concrete, silica fume, available forms, effect of silica fume on Compressive strength of concrete, construction chemicals for curing, construction chemicals for Water proofing.

Fresh Concrete: Workability, factors affecting workability, slump test, Kelly ball test, V-B test, compaction factor test, segregation, bleeding, volume batching and weigh batching, hand mixing, machine mixing, mixing time, compaction of concrete, hand compaction, compaction by vibration, internal vibrator, form work vibrator, table vibrator, platform vibrator, surface vibrator.

UNIT-III:

Hardened Concrete: General; water-cement ratio; gel/space ratio; gain of strength with age; maturity concept of concrete; effect of maximum size of aggregate on strength.

Test On Hardened Concrete: Compression test; moulds and compacting; curing; failure of compression specimen; effect of height/diameter ration strength; flexural strength of concrete; tensile strength of concrete; non-destructive testing methods

Elasticity, Creep And Shrinkage: Elastic properties of aggregate, Factor's affecting modulus of elasticity, poisson's ratio, creep and factors affecting creep, shrinkage and factors affecting shrinkage.

Durability of Concrete: Factors contributing to cracks in concrete, sulphate attack and methods of controlling sulphate attack, chloride attack, corrosion of steel and its control.

UNIT-IV:

Introduction to Special Concretes and Concreting Methods:

a) Fibre reinforced concrete; Fibres used, factors effecting properties, aspect ratio of fibres, Orientation of fibres, workability, mixing, applications, current development in FRC.

b) No-fines concrete: mix proportion, drying shrinkage, Thermal conductivity, applications.

c) Ferrocement: Casting techniques, hand plastering, semi -mechanized process, Centrifuging, guniting, applications.

d) Light-weight concrete: Natural and artificial light-weight aggregates, properties of common Light-weight concretes.

e) High performance concrete.

Mix design: Factors in the choice of mix proportions – Durability of concrete – Quality control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – ACI method & IS 10262 method

Text Books:

1. A.M.Neville "Properties of Concrete", Pearson publication – 4th editions
2. M.S.Shetty "Concrete Technology", S.Chand & Co.; 2004
3. M.S.Shetty "Concrete Technology", Pearson publication

Reference Books:

1. M.L. Gambhir "Concrete Technology", Tata Mc. Graw Hill Publishers, New Delhi
2. A.R. Santha Kumar "Concrete Technology", Oxford university Press, New Delhi
3. J.Prasad & C.G.K. Nair "Non-Destructive Test and Evaluation of Materials" by, Tata Mcgraw hill Publishers, New Delhi

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	0	0	3	[2]

(13CE406) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Objectives: The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.

1. Venturimeter : Determination of Coefficient of discharge.
2. Orificemeter : Determination of Coefficient of discharge.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Determination of Coefficient of discharge for rectangular and V – notches..
6. Determination of friction factor of Pipes.
7. Determination of loss of head in pipes due to bends, sudden contractions and sudden expansion.
8. Verification of Bernoulli's equation.
9. Determination of Manning's and Chezy's coefficients in open channel.
10. Study of Hydraulic jump.
11. Impact of jet on vanes
12. Performance test on Pelton wheel turbine.
13. Performance test on Francis turbine.
14. Efficiency test on centrifugal pump.

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	0	0	3	[2]

(13CE407) CONCRETE TECHNOLOGY LAB

Objectives: At the end of the course the student will posses knowledge about properties of concrete and how it affects the life of the concrete Structures. And also derives the desired Mix design.

TEST ON CEMENT:

1. Normal Consistency of fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity and soundness of cement.
4. Compressive strength of cement.
5. Bulking of sand.

TEST ON FRESH CONCRETE :

1. Slump Test
2. Flow table Test
3. Compaction factor Test
4. Vee-Bee Consistometer Test

TEST ON HARDENED CONCRETE:

1. Compression test on Concrete
2. Tensile test on Concrete
3. Flexural Strength on Concrete
4. Non- Destructive testing on concrete (for demonstration)

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	0	0	3	[2]

(13CE408) SURVEY FIELD WORK-II

Objectives: The experimental work involved in this laboratory will wake the student to understand the fundamental concepts and posses knowledge about field survey techniques.

LIST OF EXERCISES:

1. Study of theodolite - Measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of repetition and method of reiteration.
3. Finding out distance between two inaccessible points.
4. Trigonometric leveling - Measurement of heights and distances (Two Exercises)
5. Tacheometric surveying - Measurement of heights and distances (Two Exercises)
6. Setting out a circular curve by Rankine's method of tangential angles.
7. Setting out a circular curve by Double Theodolite method.
8. Study of total station - Measurement of horizontal angles, vertical angles and distances
9. Determination of area using total station.
10. Determination of remote height using total station.
11. Distance, gradient, and differential height between two inaccessible points using total station.
12. Stake-out using total station.
13. Traversing using total station.
14. Contouring using total station.

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	0	1	0	[2]

(13CE409) TECHNICAL SEMINAR-I

Objectives: To get involved with the latest advancements and developments to enhance communication and presentation skills, exchange of ideas, greater connectivity to develop a research bent of mind.

A Technical Seminar shall have two components, one chosen by the student from the course work as an extension and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before a committee consisting of Head of the department, seminar supervisor and a senior faculty member. Each Technical Seminar shall be evaluated for 100 marks. Technical Seminar component-I for 50 marks and component-II for 50 marks making total 100 marks. (**Distribution of marks for 50:** 10 marks for report, 10 marks for subject content, 20 marks for presentation and 10 marks for queries).

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L	T	P	[C]
2	0	0	[2]

(13HS121) QUALITATIVE AND QUANTITATIVE ANALYSIS

Objectives: To determine and measure the one's ability thorough advanced training, some specific set of skills (intellectual, motor and so on), the subject assumes that professional potential and special abilities developed.

UNIT – I:

Simple Arithmetic -Number - H.C.F. & L.C.M. of Numbers – Decimal Fractions – Simplification – Square Root and Cube Root – Average – Problems on Numbers – Problems on Ages – Percentage – Profit & Loss – Ratio & Proportion-Partnership – Chain Rule – Time & Work – Pipes & Cisterns – Time & Distance – Problems on Trains – Boats & Streams – Allegation or Mixture – Simple Interest – Compound Interest – Area Volume & Surface Areas – Volume & Surface Areas – Calendar – Clocks – Races & Games of Skill – Number Series – Tabulation – Pi –Chart – Bar Diagram – Line Graphs.

UNIT– II:

Reasoning (Verbal and Non-Verbal) -Series Completion – Analogy – Coding–Decoding – Classification – Blood Relations – Puzzle test – Sequential output tracing - Direction Sense test – Logical Venn diagrams – Alphabet test – Alpha-Numeric Sequence puzzle – Number, Ranking and time sequence test – Mathematical operations – Logical sequence of words – Arithmetical reasoning – Insert the missing character – Data sufficiency – Eligibility test – Assertion and reason – Situation reaction test – Verification of Truth of the Statement - –Cubes and dice.

UNIT – III:

Logical deductions, Non verbal reasoning

Logic – Statement-Arguments – Statement-Assumptions – Statement-Course of action – Statement-Conclusions – Deriving conclusion from passages – Theme deduction – Cause and effect reasoning

UNIT – IV:

Reading Comprehension- Purpose of reading, reading rates, improving comprehension skills, techniques for good comprehension, skimming, scanning, determining the meaning of words, different styles of worked out problems.

Text Books:

1. RS Agarwal , A textbook on Quantitative Aptitude.
2. RS Agarwal, A textbook on verbal and nonverbal reasoning .
3. Meenakshi Raman and Sangeeth Sarma, Technical Communication.

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	3	1	0	[3]

(13CE501) STRUCTURAL ANALYSIS-I

Objectives:

- To construct influence lines for finding maximum shear force and bending moment at any section in a simply supported beam/simple trusses for load combinations such as single, multiple point loads, U.D.l and their combination.
- To determine the absolute maximum bending moment and shear force in a simply supported beam for load combinations such as single, multiple point loads, U.D.l and their combination.
- To determine the Strain Energy due to axial load, shear force, bending moment and to determine the deflections in a simply supported beams, and pin jointed trusses using Castigliano's theorem.
- To determine static and kinematic indeterminacy in continuous beams, frames and trusses and to determine the deflection in a simple indeterminate truss using Castigiano's theorem-II
- To analyse a Propped Cantilever and fixed beams with a number of point loads, uniformly varying load, couple and combination of loads and settlements of supports/ rotation supports.
- To analyse continuous beams with constant moment of inertia with one or both ends fixed, with overhangs, without and with sinking of supports.
- To determine the moment values for different types of beams carrying different types of loads using slope deflection method.
- To determine the moment values for different types of beams carrying different types of loads using moment distribution method.

UNIT-I

Moving Loads: Introduction, Max SF & BM at a given section and absolute max SF & BM due to a single concentrated load, ud load longer than the span, ud load shorter than the span, two point loads with fixed distance b/w them and several point loads , equivalent ud load.

Influence Lines for Determinate Structures: Definition of influence line for SF, influence line for BM, load position for max SF at a section, load position for max BM at a section, point loads, udl longer than the span, udl shorter than the span, influence lines for forces in members of pratt and warren trusses.

UNIT-II

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

Analysis of Indeterminate Structures: Indeterminate Structural Analysis, Determination of static and kinematic indeterminacies, Solution of trusses with up to two degrees of internal and external indeterminacies, Castigliano's theorem.

UNIT-III

Fixed Beams: Introduction to statically in determinate beams with U.D.L, Central Point load, eccentric Point load, no. of point loads, U. V. L, Couple and combination of loads, S.F.D and B.M.D for above conditions, Deflection of fixed beams effect on sinking supports and rotation support. , Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

Continuous Beams: Introduction to continuous beams, Chaperon's theorem of 3 moments, Analysis of continuous beams with constant moment of inertia with one or both end fixed & simply supported, Continuous beams with over Hang, sinking of supports.

UNIT-IV

Slope Deflection Method: (For Continuous Beams) Introduction to slope deflection method, Derivation of Slope Deflection Equation, application to continuous beam with and without settlement of supports.

Moment Distribution Method (M. D. M): Introduction to M. D. M., Definition of carry over moment, carry over factor, Stiffness, Distribution factor, Problems in M.D.M with and without settlement of Supports.

Text Books:

1. Analysis of Structures vols. 1 & 2 by Vazirani & Ratwani; Khanna Publishers; Delhi.
2. S.Ramamrutham and R.Narayan "Theory of structures "Dhanpat rai Publishing Company (p).Ltd, New Delhi, 9th edition, 2012.
3. BhaviKatti, S.S, "Structural Analysis, Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008.
4. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004.

Reference Books:

1. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi,2013.
2. Devadas Menon, "Structural Analysis", Narosa Publishing House, 2008
3. Structural analysis by R. C. Hibbeler, Pearson Education.
4. L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.
5. Wang C.K., "Indeterminate Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.

Web References: NPTEL

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III B.Tech I Semester (CE)	L	T	P	[C]
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(13CE502) WATER RESOURCES ENGINEERING-I

Objectives:

India being predominantly an agricultural country with increasing population, irrigation has attained great significance in achieving the goal of self sufficiency in food production. The Present syllabus includes the conventional methods of Irrigation, detailed treatment of the modern methods of Irrigation.

- Student able to learn engineering hydrology and its applications, Hydrologic cycle, types and forms of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data etc.
- Studying Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, radial flow to wells in confined and unconfined aquifers etc.
- Studying about canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, canal lining.

UNIT-I

Hydrology: Hydrologic cycle; precipitation, types and forms, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, presentation and interpretation of rainfall data, PMP, DAD, IDF analysis. Evaporation, factors affecting evaporation, measurement of evaporation; Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices; Run, off, Factors affecting run off, Computation of run off; Design Flood; Estimation of maximum rate of run off; SCS curve number method , separation of base flow.

Hydrographs: Hydrograph analysis; Unit Hydrograph, construction and limitations of Unit hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; S, hydrograph.

UNIT-II

Ground Water: Introduction; Aquifer; Aquiclude; Aquifuge; aquifer parameters, porosity, Specific yield, Specific retention; Divisions of sub, surface water; Water table; Types of aquifers; storage coefficient, coefficient of permeability and transmissibility; well hydraulics, Darcy's law; Steady radial flow to a well, Dupuit's theory for confined and unconfined aquifers; Tube well; Open well; Yield of an open well, Constant level pumping test, Recuperation test; Introduction to well losses.

Irrigation: Introduction; Necessity and Importance of Irrigation; advantages and ill effects of Irrigation; types of Irrigation; methods of application of Irrigation water; quality for Irrigation water. Duty and delta; duty at various places; relation between duty and delta; factors affecting duty; methods of improving duty.

UNIT-III

Water Requirement of Crops: Types of soils, Indian agricultural soils, preparation of land for Irrigation; soil fertility; Soil, water, plant relationship; vertical distribution of soil moisture; soil moisture tension; soil moisture stress; various soil moisture constants; Limiting soil moisture conditions; Depth and frequency of irrigation; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; crop seasons and crop rotation; Irrigation efficiencies; Determination of irrigation requirements of crops; Assessment of Irrigation water. Consumptive use of water, factors affecting consumptive use, direct measurement and determination by use of equations (theory only).

Irrigation Channels - SILT Theories: Classification; Canal alignment; Inundation canals; Cross section of an irrigation channel; Balancing depth; Borrow pit; Spoil bank; Land width; Maintenance of irrigation channels; Silt theories, Kennedy's theory, Kennedy's method of channel design; Silt supporting capacity according to Kennedy's theory; Use of Garret's diagram in channel design; Drawbacks in Kennedy's theory; Lacey's regime theory, Lacey's theory applied to channel design; Use of Lacey's regime diagrams; Defects in Lacey's theory; Comparison of Kennedy's and Lacey's theory.

UNIT-IV

Water Logging And Canal Lining: Water logging; Effects of water logging; Causes of water logging; Remedial measures; Saline and alkaline soils and their reclamation; Losses in canal; Lining of irrigation channels , necessity, advantages and disadvantages; Types of lining; Design of lined canal. Economics of canal lining; Drainage and pressure release arrangements behind canal lining.

Diversion Head Works: Types of diversion head works; Diversion and Storage head works; weirs and barrages; Layouts of diversion head works; components; Causes and failure of hydraulic structures on permeable foundations; Blighs creep theory; Khoslas theory; Determination of uplift pressure, impervious floors using Blighs and Khoslas theory; Exit gradient.

Text Books:

1. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi
2. Engineering Hydrology by K.Subramanya, The Tata Mcgraw Hill Company, Delhi
3. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi.

Reference Books:

1. Engineering Hydrology by Jayarami Reddy, Laxmi publications pvt. Ltd., New Delhi
2. Engineering Hydrology by Srinivasan , Oxford Pubilishers, New Delhi
3. Irrigation and Water Resources & Water Power by P.N.Modi, Standard Book House.
4. Irrigation Water Management by D.K. Majundar, Printice Hall of India.

Web References: NPTEL

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(13CE503) REINFORCED CONCRETE STRUCTURES-I

Objectives:

- To learn design principles of Working stress and Limit state Designs as per IS: 456-2000
- To know the design parameters of singly reinforced, doubly reinforced, flanged beam elements for flexure as well as their load carrying capacities.
- To design beam element subjected to shear, torsion and bond.
- To know the design parameters of slabs.
- To check for Limit state of serviceability.

UNIT I

Introduction: Objectives of structural design , stability, strength and serviceability; Design codes and handbooks; Design philosophies , working stress method, ultimate load method and limit state method, Grades of steel and cement, Stress, Strain characteristics of concrete and steel.

Working Stress Method: General Introduction, Fundamental assumptions, Method of Transformed Sections, Stress, Strain relationship , Rectangular Sections in Bending with Tension Reinforcement only , Under, reinforced, Ideally reinforced (Balanced) and Over, reinforced Sections , Design of Rectangular sections in Bending with Tension Reinforcement only and with both Tension & Compression reinforcement.

UNIT II

Limit State Method (L.S.D.) of design: Limit State of Collapse in Flexure: Introduction and Principles of L.S.D., Characteristic load and strengths, Design values, Partial safety factors, Factored loads.

Flexure of R.C.C. Beams of Rectangular Section: Under reinforced, Balanced and over reinforced sections.

Compression stress block, Estimation of ultimate moment by strain compatibility. Guide lines for choosing width, depth and percentage of reinforcements in beams.

Design of singly reinforced rectangular beams and doubly reinforced beams.

Design of flanged beams (T and L), Effective flange width, Basis of analysis and design, Minimum and Maximum steel in flanged beams.

UNIT-III

Design of one way, two way slabs & Continuous slabs in Limit State Method:

Different kinds of loads on slabs including partition walls ,Simply supported slabs on all four sides, Moment in two way slabs with corners held down. Choosing slab thickness. Design of restrained slabs (with torsion at corners) I.S. code provisions. Detailing of reinforcement. Load from slabs on supporting beams. Shear in slabs. Design of one way continuous slabs.

UNIT-IV

Shear Torsion and Bond: Limit state of collapse in shear, types of shear failures, Truss analogy, shear span / depth ratio, Calculation of shear stress, types of shear reinforcement. General procedure for design of beams for shear. Enhanced shear near supports,. Shear in slabs, steel detailing. Analysis for torsional moment in a member. Torsional shear stress in rectangular sections. Reinforcement for torsion in RC beams. Principles of design for combined bending shear and torsion. Detailing of torsion reinforcement, Concept of bond, development length, anchorage bond, flexural bond.

Assignment: The students should prepare the following plates. Plate 1 Detailing of Beams
Plate 2 Detailing of Slabs

Text Books :

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
2. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.
3. Unnikrishnan Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing krish Company Ltd., 2009.
4. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publilcations, Pune, 2013.
5.Dr.B.C.Punmia,Er.Ashok Kumar Jain, Dr.Arun K.Jain "RCC Designs(Reinforced Concrete Structures)",Lakshmi publications,10th Edition, 2006.

Reference Books:

1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998.
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002
3. Bandyopadhyay. J.N., "Design of Concrete Structures"., Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
4. Subramanian,N.,"Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.

CODES:

IS: CODES:

1) IS -456-2000

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(13CE504) DESIGN OF STEEL STRUCTURES-I

Objectives:

- To learn about the basics of steel sections and their prominence in constructions.
- To learn about the methods of connection between various structural elements.
- To learn about the beams and their behavior under different loading and supporting conditions.
- To learn about the behavior of structural elements under tensile and compressive loadings.
- To learn how to use different standard steel sections to form a built-up member.

UNIT - I

Bolted and Riveted Connections: Introduction, advantages and disadvantages of bolting and riveting, General terminology, Strength of bolts and rivets, bearing stress and shear stress, Permissible limits, IS Code requirements.

Welded Connections: Introduction, advantages and disadvantages of welding, Strength of welds, Butt and fillet weld; Permissible stresses, IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT - II

Laterally Supported Beams: Design of simple and compound beams, Curtailment of flange plates.

Laterally Unsupported Beams: Design of laterally unsupported beams.

UNIT -III

Tension Members: General Design of members subjected to direct tension and bending, effective length of columns; Slenderness ratio, permissible stresses.

Compression Members: Design of axially loaded compression members, struts; eccentrically loaded columns; Splicing of members using bolting.

UNIT - IV

Design of Lacings: Design principles as per IS Code. Design of single and double lacing system using bolting for channel and angle sections.

Design of Battens: Design principles and specifications as per IS Code. Design of batten systems using bolting for channel and angle sections.

Assignment: The students should prepare the following plates. Plate 1 Detailing of simple beams Plate 2 Detailing of Compound beams including curtailment of flanges. Plate 3 Detailing of Column including lacing. Plate 4 Detailing of Column including battens.

Text Books:

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.
2. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS: 800, 2007, IK International Publishing House Pvt. Ltd., 2009.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

Reference Books:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800,2007 Structures Publications, 2009.
5. IS 800:2007, General Construction In Steel, Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

Codes/Tables:

IS: CODES-STEEL TABLES:

1) IS -800, 2007
2) IS - 875, Part III
3) Steel Tables.
4) IS 1367 (PART 3)

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(13CE505) SOIL MECHANICS

Objectives:

- Creating awareness to student about soils and their engineering importance.
- Helping students in aquatinting various procedures and tests for classifying soils and develop relationships among various properties.
- Imparting knowledge for students about behavior of soils under various drainage Conditions.
- Making students to perform computations for determination of strength parameters of soil with using various theories.
- Developing knowledge about conduct of different lab tests for determining engineering properties by simulating field conditions.

UNIT -I

I**ntroduction**: Soil formation, soil structure and clay mineralogy, Adsorbed water, Mass, volume relationship, Relative density.

Index Properties of Soils: Moisture Content, Specific Gravity, Insitu density, Grain size analysis , Sieve and Hydrometer methods , consistency limits and indices , I.S. Classification of soils

UNIT-II

Permeability: Soil water, capillary rise, flow of water through soils, Darcy's law, permeability, Factors affecting, laboratory determination of coefficient of permeability, Permeability of layered systems.

Seepage through Soils: Total, neutral and effective stresses, quick sand condition, Seepage through soils, Flownets: Characteristics and Uses.

Stress Distribution in Soils: Boussinesq's and Wester gaard's theories for point loads and areas of different shapes, Newmark's influence chart.

UNIT -III

Compaction: Mechanism of compaction, factors affecting, effects of compaction on soil properties. , Field compaction Equipment, compaction control.

Consolidation : Types of compressibility , Immediate Settlement, primary consolidation and secondary consolidation , stress history of clay; e,p and e,log p curves , normally consolidated soil, over consolidated soil and under consolidated soil , preconsolidation pressure and its determination , Terzaghi's 1,D consolidation theory , coefficient of consolidation: square root time and logarithm of time fitting methods , computation of total settlement and time rate of settlement..

UNIT - IV

Shear Strength of Soils : Importance of shear strength , Mohr's, Coulomb Failure theories , Types of laboratory tests for strength parameters , strength tests based on drainage conditions , strength envelops , Shear strength of sands , dilatancy , critical void ratio , Liquefaction, shear strength of clays.

Text Books:

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
2. Soil Mechanics and Foundation by by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
3. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).

Reference Books:

1. Soil Mechanics and Foundation Engineering by Purushtoma Raj, Pearson Publications.
2. Geotechnical Engineering V.N.S.Murthy, CRC Press, Newyork, Special Indian Edition.
3. Soil Mechanics, T.W. Lambe and Whitman, McGraw Hill Publishing Company, Newyork.
4. Geotechnical Engineering by Brije.M.Das, Cengage Publications, New Delhi.
5. Geotechnical Engineering by IQBAL H.KHAN, PHI Pubilishers.
6. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd,New Delhi.

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(13CE506) ENVIRONMENTAL ENGINEERING

Objectives:

- To impart the knowledge on various sources of water with reference to quality and quantity in a locality, their suitability for domestic application and drinking.
- To know the water quality standards and water analysis, air and noise pollution
- To know various treatment units in a particular sequence as per the quality of water and to design them. The student also learns about the network of pipes with various appurtenances including service reservoirs, various types of valves etc.
- To know types of Sanitation, sewages, sewers and sewer appurtenances
- To learn various tests to be conducted to know the quality of sewage.
- To know various treatment unit and their design for the treatment of domestic waste water and its disposal.
- To know the solid waste management at primary level.

UNIT -I

Air Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

Noise Pollution: Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

Water Demand and Quantity Studies : Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.

Quality and Analysis of Water: Characteristics of water, Physical, Chemical and Biological. Analysis of Water, Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

UNIT - II

Water Treatment: Layout and general outline of water treatment units , sedimentation , principles , design factors , coagulation, flocculation clarifier design , coagulants , feeding arrangements. Filtration and Chlorination: Filtration , theory , working of slow and rapid gravity filters , multimedia filters , design of filters , troubles in operation of filters , disinfection , theory of chlorination, chlorine demand, other disinfection practices, Miscellaneous treatment methods

Water Distribution : Distribution systems , Requirements, Layout of Water distribution systems , Design procedures, Hardy Cross and equivalent pipe methods, service reservoirs , joints, valves such as sluice valves, air valves, scour valves and check valves, water meters , laying and testing of pipe lines , pump house, waste detection and prevention.

UNIT- III

Introduction to Sanitation :systems of sanitation , relative merits & demerits , collection and conveyance of waste water , sewerage , classification of sewerage systems, Estimation of sewage flow and storm water drainage , fluctuations , types of sewers , Hydraulics of sewers and storm drains, design of sewers , materials for sewers, appurtenances in sewerage , cleaning and ventilation of sewers.

Waste Water Collection and Characteristics : Conservancy and water carriage systems , sewage and storm water estimation , time of concentration , storm water overflows combined flow , characteristics of sewage , cycles of decay , decomposition of sewage, examination of sewage , B.O.D. , C.O.D. equations.

UNIT- IV

Waste Water Treatment: Layout and general outline of various units in a waste water treatment plant , primary treatment: design of screens , grit chambers , skimming tanks , sedimentation tanks , principles of design , biological treatment , trickling filters , standard and high rate , Construction and design of Oxidation ponds.

Sludge Treatment: Sludge digestion, factors effecting, design of Digestion tank, Sludge disposal by drying, septic tanks and Imhoff Tanks, working principles and design, soak pits.

Solid Waste Management: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle energy recovery, treatment and disposal).

Text Books:

1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C.Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Water supply and sanitary Engineering by S.K.Garg,

Reference Books:

1. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.
2. Water and Waste Water Technology by Steel.
3. Environmental Science and Engineering by J.G.Henry and G.W.Heinke, Person Education..
4. Water and Waste Water Engineering by Fair Geyer and Okun
5. Waste water treatment, concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India.
6. Waste water engineering by Metcalf and Eddy.

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(13CE507) GEO TECHNICAL ENGINEERING LAB

Objectives:

The objective of this lab is to make the student aware of soil properties, behavior of soil and its testing procedures.

List of Experiments:

1. Grain size distribution of cohessionless soil by sieving & fine-grained soil by hydrometer analysis (Demo).
2. Determination of Atterberg's limits (liquid limit, plastic limit & shrinkage limit).
3. Determination of specific gravity of Cohesionless soil.
4. Determination of in, situ density by core cutter method & sand replacement method.
5. Determination of co, efficient of permeability by constant head & variable head methods.
6. Determination of compaction characteristics of soil.
7. Unconfined compression test.
8. CBR test.
9. Triaxial compression test.
10. Direct shear test & Differential free, swell.

Reference Books:

1. Soil Testing by T.W. Lamb (John wiley)
2. SP, 36 (Part I, & Part, II)
3. Soil Mechanics Laboratory Manual by Braja Mohan Das, Oxford University Press.
4. Measurement of engineering properties of soil by E Saibaba Reddy & K. Rama Sastri. (New age International publication.

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(13CE508) ENVIRONMENTAL ENGINEERING LAB

Objectives: The objective of this lab is to make the student aware of water properties, determination of dissolved and non-dissolvable constituents in water.

List of Experiments:

1. Determination of pH and Turbidity.
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D.
11. Determination of C.O.D.
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coliform test.

Note: At least 8 of the above experiments are to be conducted.

List of Equipment:

1. PH meter
2. Turbidity meter
3. Conductivity meter
4. Hot air oven
5. Muffle furnace
6. Dissolved Oxygen meter
7. U, V visible spectrophotometer
   a) Reflux Apparatus
   b) Jar Test Apparatus
   c) BOD incubator
   d) COD Extraction apparatus

Text Books:

1. Chemistry for Environmental Engineering by Sawyer and Mc. Carty
2. Standard Methods for Analysis of water and Waste Water, APHA
3. Environmental Engineering Lab Manual by Dr.G.Kotaiah and Dr.N.Kumara Swamy, Charotar Publishers, Anand.

Reference Book: Relevant IS Codes.

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III B.Tech I Semester (CE)

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(13CE509) BUILDING DRAWING

Course objectives:

- Get an idea about building drawing standards in various phases of a project.
- Know the detailing in building construction.
- Understand about planning of various buildings like residential, educational, office buildings and hospital buildings.
- To improve imagination and creative skills in planning and detailing various types of buildings.

PART-A

UNIT-I

Sign Conventions and Bonds: Sign conventions for different materials used in civil engineering. Bonds: English bond & Flemish bond odd & even courses for one, one and half, two and two and half brick walls in thickness at the junction of a corner.

Doors Windows, Ventilators and Roofs: Paneled Door, paneled and glazed door; glazed windows, paneled windows; Couple roof, Collar roof; Kind Post truss , Queen post truss.

PART-B

UNIT -II

Given line diagram with specification to draw plan, section and elevation using principles of planning and local building bye, laws:

1. Residential Building
2. Primary Health Center
3. Primary School Building

UNIT- III

Given line diagram with specification to draw plan, section and elevation using principles of planning and local building bye, laws:

1. Hotel
2. Bank building
3. Post office

Final Examination Pattern: The end examination paper should consist of Part A and Part B. Part A consists of one question with either or choice from unit-I .Each question carries 10 marks. Total marks for Part A is 10 marks. Part, B consists of two questions with either or choice from drawing portion from each unit. Each question carries 30 marks. Question from Part A carries 10 marks and question from Part B carries 60 marks (2 questions X 30 marks). Total 70 marks.

Text Books:

1. Planning and Designing and Scheduling, Gurucharan singh and Jagadish singh, Standard Publishers.
2. Building drawing with an integrated approach to building environment, M.G.Saha, G.M.Kale, S.Y.patki, Tata Mc Graw Hill.
3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.

Reference Books:

1. Building planning and design , N.Kumara swamy and A.Kameswara rao. Charitor publications

Web References: NPTEL, www.floorplanner.com

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(13CE601) STRUCTURAL ANALYSIS-II

Objectives:

- To analyze the arches and obtained the forces
- To determine the moment values in frames for different types of loads using slope deflection method
- To determine the moment values in frames for different types of loads using moment distribution method.
- To determine the moment values in beams and frames for different types of loads using kani's method.
- To determine the moment values in beams for different types of loads using matrix method.

UNIT-I

Three Hinged Arches: Elastic theory of arches, Eddy's theorem, determination of horizontal thrust, BM, NT & RSF, effect of temperature.

Two Hinged Arches: Determination of horizontal thrust, BM, NT & RSF, Rib shortening and temperature stresses, Tied arches. Fixed arches (theory only).

UNIT-II

Slope Deflection Method for Frames: Analysis of single bay, single storey, portal frame including side sway.

Moment Distribution Method for Frames: Stiffness and carry over factors, Distribution factors, Analysis of single storey portal frames, including Sway, Substitute frame analysis by two cycle method.

Cables: Analysis of cables under UDL and concentrated loads. Shape of cable under self weight.

UNIT-III

KANI'S Method: Introduction, Application to continuous beams without and with yielding of supports, Analysis of single bay, single storey portal frames (vertical legs only) including side sway.

Plastic Analysis: Introduction , Idealized stress ,Strain diagram , shape factors for various sections , Moment curvature relationship , ultimate moment , Plastic hinge , lower and upper bound theorems , ultimate strength of fixed and continuous beams.

UNIT-IV

Flexibility Matrix Method: Introduction, Application to continuous beams including support yielding.

Stiffness Matrix Method: Introduction, Application to continuous beams including support yielding. Application to Analysis of single bay, single storey portal frames (vertical legs only) including side sway. Relationship between flexibility matrix and stiffness matrix.

Text Books:

1. Analysis of Structures vols. 1 & 2 by Vazirani & Ratwani; Khanna Publishers; Delhi.
2. S.Ramamrutham and R.Narayan “Theory of structures “Dhanpat rai Publishing Company (p).Ltd, New Delhi, 9th edition, 2012.
3. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, “Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004
4. Pandit G.S. & Gupta S.P. "Structural Analysis, a Matrix Approach", Tata McGraw Hill 2004.

Reference Books:

1. Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi,2013.
2. Devadas Menon, “Structural Analysis”, Narosa Publishing House, 2008
3. Structural analysis by R. C. Hibbeler, Pearson Education.
4. L.S. Negi & R.S. Jangid, “Structural Analysis”, Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.
5. Wang C.K., “Indeterminate Structural Analysis”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
6. BhaviKatti, S.S, "Structural Analysis, Vol. 1 & Vol. 2", Vikas Publishing Pvt Ltd., New Delhi, 2008.

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(13CE602) WATER RESOURCES ENGINEERING-II

Objectives:

The course content enables students to:

- Relate the head works constructed at the head of the canal and types and different components and their purposes.
- Understand different theories behind the design of impervious floor in permeable soils.
- Identify canal regulation structures and cross drainage structures come in the alignment of the channels.
- Analyze for the forces to be considered in the in the stability Gravity dams
- Distinguish between earthen embankments and Causes of its failures and seepage theories
- Understand about the development of water power

UNIT- I

Canal Regulation Works: (Theory only) Canal Falls: Necessity and location of falls; Types of falls; classification of falls; cistern design; roughening devices; design of sarada type fall. Canal Regulators: off, take alignment; head regulators and cross, regulators; design of cross, regulator and distributary head regulator. Canal outlets: Introduction; Requirements of a good module; types of outlets; flexibility, proportionality, setting, hyper proportional outlet, sub, proportional outlet, sensitivity, efficiency of an outlet, drowning ratio, modular limit; canal escapes, types; Metering flumes, types.

CROSS DRAINAGE WORKS: Introduction; types of cross drainage works; selection of suitable type of cross drainage work; classification of aqueducts and siphon aqueducts.

UNIT-II

Reservoir Planning: Introduction; classification; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Reservoir sedimentation; Life of reservoir; Reservoir sediment control; Flood routing; Methods of flood routing, Graphical Method (Inflow , storage discharge curves method).

DAMS : GENERAL: Introduction; Classification according to use; classification according to design; classification according to material, Gravity dams, Arch dams, Buttress dams, Steel dams, Timber dams, Earth dams and rock fill dams, advantages and disadvantages; Physical factors governing selection of type of dam ; selection of site for a dam.

UNIT-III

Gravity Dams: Introduction; Forces acting on a gravity dam; Combination of loading for design; Modes of failure: stability requirements; principal and shear stresses; Stability analysis, Gravity method; Elementary profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a

gravity dam, High and low gravity dams; Design of gravity dams, single step method; Galleries; Stability analysis of non, overflow section of Gravity dam.

Spillways: Introduction; Types of spillways; Profile of ogee spillway; Energy dissipation below spillways for relative positions of jump height curve and tail water curve; Spillway crest gates, Types.

UNIT-IV

Earth Dams: Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams; Section of an earth dam; Design to suit available materials; Seepage control measures; Slope protection. Seepage through earth dam, graphical method.

Water Power Engineering: Development of hydro power in India; Classification of hydel plants: runoff river plants, storage plants and pumped storage plants; low, medium and high head schemes ; Investigation and planning; components of hydel schemes , fore bay, intake structure, surge tanks, penstocks , power house, turbines, selection of suitable type of turbine, Scroll casing .draft tube and tail race; assessment of available power; definition of gross head ,operating head ,effective head; Flow duration curve; Power duration curve; Load duration curve; Load curve ; primary power and secondary power; installed capacity, dependable capacity; firm power, secondary power; power factor ;load factor, capacity factor ,utilization factor and Diversity factor.

Text Books:

1. Irrigation and Water Power Engineering by Dr. B.C.Punmia & Dr. Pande B.B. Lal; LaxmiPublications pvt. Ltd., New Delhi.
2. Irrigation Engineering and Hydraulic Structure by S. K. Garg; Khanna Publishers, Delhi.
3. Irrigation, Waterpower and Water Resources Engineering by K R Arora; Standard Publication, New Delhi.

Reference Books:

1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.
2. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta.
3. Water resources engineering by Satyanarayana Murthy. Challa, New Age International Publishers.
4. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers.
5. Irrigation and Water Power Engineering by Punmia and Lal, Laxmi Publications, New Delhi.

Web References: NPTEL

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(13CE603) REINFORCED CONCRETE STRUCTURES-II

Objectives:

- To know the design parameters of short and long columns subjected axial load, axial load and moments using SP: 16 charts.
- To know the design parameters of footings.
- To know the design parameters of staircases.
- To learn about the design of slabs by yield line analysis.

UNIT-I

Columns (Limit State Method): Assumptions; Design of axially loaded columns; Design of axially loaded Circular columns with helical reinforcement; Interaction diagrams; Design of short Columns and slender columns of rectangular section in the following cases

(a) Axial compression and uni axial bending.

(b) Axial compression and bi axial bending (Using SP, 16 Charts)

UNIT-II

Foundations (Limit State Method): Types of Foundations ,Soil pressure under foundation, Design and detailing of isolated column footings, combined footings(Rectangular & trapezoidal footings) & strap footings.

UNIT-III

Yield Line Analysis: Analysis and Design of Slabs using yield line theory. Slabs supported on four edges, three edges and two opposite edges subjected to uniformly distributed load.

UNIT-IV

Design of staircases: Introduction, Types of staircases, Loads acting on stair slabs, doglegged stair case design (Design of stair slabs spanning transversely and longitudinally).

Limit State of Serviceability: Limit state design of serviceability for deflection, cracking and codal provisions.

Assignment: The students should prepare the following plates. Plate 1 Detailing of Columns
Plate 2 Detailing of Foundations Plate 3 Detailing of Slabs and Beams Plate 4 Detailing of Staircases

Text Books:

1. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
2.Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”, Laxmi Publication Pvt. Ltd., New Delhi, 2007.
3.Unni na Pillai, S., Devdas Menon, “Reinforced Concrete Design”, Tata McGraw Hill Publishing Krish Company Ltd., 2009.
4.Subramanian, N.,”Design of Reinforced Concrete Structures”, Oxford University Press, New Delhi, 2013.
5.Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publilcations, Pune, 2013.

Reference Books:

1. Jain, A.K., “Limit State Design of RC Structures”, Nemchand Publications, Roorkee, 1998 Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
2. Bandyopadhyay. J.N., "Design of Concrete Structures"., Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
3. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000.
4. SP16, IS456:1978 “Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999.
5. SP 34: Hand Book on Reinforcement Detailing.

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(13CE604) DESIGN OF STEEL STRUCTURES-II

Objectives:

- To learn about various types of column foundations.
- To learn types of roof trusses and have a basic idea of IS Code recommendations for roof trusses
- To learn the design principles of plate girder with basic knowledge of IS Code recommendations.
- To learn about loads and forces acting on gantry girder including its design.

UNIT-I

Design of Column Foundations:

a) Design of slab base

b) Gusseted bases

c) Column bases subjected to moment.

UNIT-II

Roof Trusses: Different types of trusses, Design loads, Load combinations IS Code recommendations, structural details, economic spacing of trusses; Design of simple roof trusses involving the design of purlins.

UNIT-III

Plate Girder: Design consideration, IS Code recommendations Design of plate girder, (Welded) Curtailment of flange plates, end stiffeners, intermediate stiffeners.

UNIT-IV

Gantry Girder: Loads acting on girder, Gantry girder impact factors, longitudinal forces, Design of Gantry girders.

Assignment: The students should prepare the following plates.

Plate 1 Detailing of Slab base

Plate 2 Detailing of Gusseted bases

Plate 3 Detailing of Plate girders with and without stiffeners

Plate 4 Detailing of Gantry girders

Text Books:

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005
2. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS: 800, 2007, IK International Publishing House Pvt. Ltd., 2009
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

Reference Books:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013.
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2nd Edition, 2013.
3. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800,2007 Structures Publications, 2009.
5. IS 800:2007, General Construction in Steel, Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007.

Codes/Tables: IS Codes:

1) IS, 800, 2007
2) IS, 875, Part III
3) Steel Tables.
4) Railway Design Standards Code and steel tables to be permitted into the examination hall.

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(13CE605) FOUNDATION ENGINEERING

Objective: To use the principles of Soil mechanics to design the foundations, Earth retaining structures and slope stability safely and economically knowledge of the subject is essential.

UNIT- I

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

Earth Slope Stability: Infinite and finite earth slopes , types of failures , factor of safety of infinite slopes , stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method , Taylor's Stability Number, Stability of slopes of earth dams under different conditions.

UNIT -II

Earth Pressure Theories: Rankine's theory of earth pressure, earth pressures in layered soils, Coulomb's earth pressure theory, Rebhann's and Culmann's graphical method.

Retaining Walls: Types of retaining walls, stability of retaining walls.

UNIT- III

Shallow Foundations: Types, choice of foundation, Location of depth, Safe Bearing Capacity, Terzaghi`s, Meyerhoff's and Skempton`s Methods.

Allowable Bearing Pressure: Safe bearing pressure based on N, value, allowable bearing pressure; safe bearing capacity and settlement from plate load test, allowable settlements of structures, Settlement Analysis.

UNIT -IV

Pile Foundation: Types of piles, Load carrying capacity of piles based on static pile formulae, Dynamic pile formulae, Pile load tests, Load carrying capacity of pile groups in sands and clays, Settlement of pile groups.

Well Foundations: Types, Different shapes of wells, Components of wells, functions and Design Criteria, Sinking of wells, Tilts and shifts.

Text Books:

1. Geotechnical Engineering by C.Venkataramaiah, New Age Publications.
2. Soil Mechanics and Foundation Engineering by Arora, Standard Publishers and Distributors, Delhi
3. Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi.

Reference Books:

1. Soil Mechanics and Foundation Engineering by Purushtoma Raj, Pearson Publications.
2. Das, B.M.,(1999) Principles of Foundation Engineering ,6th edition (Indian edition) Thomson Engineering
3. Foundation Engineering by Varghese, P.C., Prentice Hall of India., New Delhi.
4. Foundation Engineering by V.N.S.Murthy, CRC Press, New Delhi.
5. Bowles, J.E., (1988) Foundation Analysis and Design, 4th Edition, McGraw, Hill Publishing Company, Newyork.
6. Geotechnical Engineering by Manoj Dutta & Gulati S.K , Tata McGraw-Hill Publishers New Delhi.
7. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2005.

IS Codes:

IS 6403: 1981
IS 8009: 1976 - (Part1&Part-2)
IS 2911: 1979-(Part1, Part-2, Part-3 & Part-4)

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(13CE606) TRANSPORTATION ENGINEERING-I

Objectives:

- To have a basic knowledge on road development plans and history of highways in India.
- Design for individual elements of highway geometry
- Conduct experiments for ascertaining the quality of highway materials
- Identify various stages in construction of pavements.

UNIT- I

Highway Development and Planning: Highway development in India , Necessity for Highway Planning, Different Road Development Plans Classification of Roads, Road Network Patterns , Planning Surveys, Highway Alignment, Factors affecting Alignment, Engineering Surveys.

UNIT -II

Highway Geometric Design: Cross sectional elements; design speed, passing and non, passing sight distances; PIEV theory, requirements and design principles of horizontal alignment including radius of curvature, super elevation, extra widening, design of transition curves, curve resistance, set back distance, grade compensation and vertical alignment.

UNIT - III

Highway Materials: Subgrade soil: classification, Soil compaction and its importance, Subgrade soil strength, California Bearing Ratio, Modulus of Subgrade Reaction. Stone aggregates: Desirable properties, Tests for Road Aggregates. Bituminous Materials: Types , Desirable properties, Tests on Bitumen, Bitumen Grading System, Bituminous paving mixes: Requirements, Marshall Method of Mix Design.

Introduction to Highway Construction: Cleaning and grubbing, Earthwork, Suitable materials for embankment and Subgrade, construction of embankment and Subgrade, checking field densities.

UNIT- IV

Highway Pavement Design: Flexible Pavements , Objects & Requirements of pavements , Types , Functions of pavement components , Design factors ,Flexible Pavement Design as per IRC 37:2012. Rigid Pavement, Types , Westergaard principles, wheel load stresses , Temperature stresses , Design of Rigid Pavement as per IRC58: 2011, Design of Joints.

Text Books:

1. Highway Engineering, S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 7th edition (2000).
2.Traffic Engineering & Transportation Planning, Dr.L.R.Kadyali, Khanna Publications, 6th Edition, 1997.
3. IRC: 37, 2012 Tentative Guidelines for the Design of Flexible Pavements.
4. IRC: 58, 2011 Guidelines for Design of Plain Jointed Rigid Pavements for Highways.
5. MoRTH: Specifications for Road and Bridge Works, V, Edition

Reference Books:

1. Principles of Traffic and Highway Engineering, Garber & Hoel, Cengage Learning.
2.Principles and Practices of Highway Engineering, Dr.L.R.Kadiyali and Dr.N.BLal, Khanna Publications.
3. Highway Engineering, S.P.Bindra, Dhanpat Rai & Sons. , 4th Edition (1981).

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(13CE607) COMPUTER AIDED DRAFTING

Objectives:

The course content enables students to:

- Plot the layout of building for a given details
- Create multiview drawings (orthographic projections).
- Draw section views.
- Create shapes and symbols for different uses.
- Create and manage symbols libraries.

Using CAD Software, Draw & Print the Following Drawings:

UNIT-I

1. Draw conventional signs as per I.S. standards, symbols used in civil engineering drawing.
2 .Draw the important joinery components of the building, like elevation of fully paneled double leaf door, elevation of partly glazed and partly paneled window.
3. Draw the important building components like section of a load bearing wall foundation to Parapet.
4. Prepare the king post & Queen post truss and label the various parts.
5. Plan, Elevation, Section of Single storeyed residential building (Two bed room house)
6. Plan, Elevation, Section of Multi storeyed framed structure type residential building (Two bed Room house)

UNIT-II

1. Structural detailing drawings:
   a) Singly reinforced simply supported rectangular beam.
   b) Lintel cum sunshade
   c) Continuous Beam.
   d) Simply supported two way slab.
   e) Isolated Column with square footing
2. Layouts of electrical lines in buildings: a) One bed Room House b) Two bed room House.
3. Drawings to be submitted for approval to corporation or municipality showing required details in one sheet such as (Residential/Office building):
   a) Plan, Showing Dimensions of all rooms.
   b) Section, showing Specifications and Typical Foundation Details.
   c) Elevation.
   d) Site Plan, Showing Boundaries of Site and Plinth Area, Car Parking, Passages and location of Septic Tank.
   e) Key plan, showing the location of Building.
   f) Title Block, Showing signature of Owner & Licensed surveyor's.

Text Books:

1. B.P. Verma, Drawing & House Planning, || Khanna publishers Civil Engg, Delhi
2. Dr. Balagopal & T.S. Prabhu —Building drawing & detailing, || Spades Publishers, Calicut.

Reference Books:

1 Shah, —Building drawing Tata McGraw, Hill.

2 Dr. N. Kumaraswamy, A. Kameswara Rao, —Building planning & Drawing,Charotar Publishing.

3 Shah, Kale and Patki, Building Drawing Tata McGraw, Hill.

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(13CE608) HIGHWAY ENGINEERING LAB

Objectives:

The course content enables students to know about the properties of aggregate and bitumen such as crushing value, impact values, water absorption, flakiness, fines value etc.,

Tests on Aggregates

1. Aggregate Crushing value.
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Abrasion Test.
5. Shape tests: Flakiness, elongation & Angular
6. 10% fines value test
7. Road roughness test using MERLIN

Tests on Bituminous Materials

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

References:

1. BIS codes on Aggregates & Bituminous materials.
2. Highway material testing (Laboratory Manual) by S.K. Khanna and CE.G. Justo.
3. Relevant IS & I.R.C. codes.

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(13HS122) SOFT SKILLS LAB

Objectives: Keeping in mind the previous exposure of the student to English, this lab focuses on improving the student's efficiency in English at all levels. The lab intends to train students to use language effectively, to participate in group discussions, to help them face interviews, and sharpen public speaking skills and enhance the confidence of the student by exposing him/ her to various situations and contexts which he/ she would face in his/ her career.

Activity– 1: Reading Comprehension
Activity– 2: Listening Comprehension
Activity– 3: Technical Report Writing
Activity– 4: Resume Writing
Activity– 5: Group Discussion
Activity– 6: Situation Dialogues
Activity– 7: Interview Skills
Activity– 8: Technical Presentation

Reference Books:

1. Dr.Alex, "Soft Skills" – Know yourself & Know the world.
2. Huckin and Olsen, Technical Writing and professional communication, Tata Mc Graw-Hill 2009.
3. Scott Morgan and Barrett Whitener, Speaking about Science, A Manual for Creating Clear Presentations ,Cambridge University press, 2006
4. Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford University Press 2009.
5. M. Ashraf Rizvi, Resume's and Interviews, Tata Mc Graw-Hill, 2008
6. KK Ramachandran and KK Karthick, Form Campus To corporate, Macmillan Publishers, India Ltd, 2010
7. Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, English Language Communication: A Reader cum Lab Manual, Anuradha Publications, Chennai 2008.
8. K R Lakshminarayan and T. Muruguvel , Managing Soft Skills, Sci-Tech Publication, 2010
9. John X Wang, Business Communication, CRC Press, Special Indian Edition, 2008.

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(13CE609) TECHNICAL SEMINAR-II

Objectives: To get involved with the latest advancements and developments to enhance communication and presentation skills, exchange of ideas, greater connectivity to develop a research bent of mind.

A Technical Seminar shall have two components, one chosen by the student from the course work as an extension and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before a committee consisting of Head of the department, seminar supervisor and a senior faculty member. Each Technical Seminar shall be evaluated for 100 marks. Technical Seminar component-I for 50 marks and component-II for 50 marks making total 100 marks. (**Distribution of marks for 50:** 10 marks for report, 10 marks for subject content, 20 marks for presentation and 10 marks for queries).

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(13CE701) ADVANCED STRUCTURAL ENGINEERING

Objectives:

- To learn about the design principles of different types of water tanks.
- To have a basic knowledge on design principles of grid and flat slabs.
- To learn about design of bunkers and silos.

UNIT - I

Design of circular and rectangular water tanks resting on ground.

UNIT - II

Design of Intz water tank excluding staging.

UNIT - III

Grid Floor: Analysis and Design of Grid Floors as per IS Code and more rigorous method.

Flat Slabs: Different Components of a Flat Slab, Direct Design Method, Bending Moments in the interior and end Spans.

UNIT – IV

Design of Bunkers and Silos.

Outcomes:

The student shall have a comprehensive design knowledge related to various structural systems.

Text Books:

1. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.

2. Dayaratnam, P., “Brick and Reinforced Brick Structures”, Oxford & IBH Publishing House, 1997.

3. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006.

4. Varghese.P.C. "Advanced Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2012.

Reference Books:

1. Mallick, D.K. and Gupta A.P., "Reinforced Concrete", Oxford and IBH Publishing Company, 1997.
2. Syal, I.C. and Goel, A.K., "Reinforced Concrete Structures", A.H. Wheelers & Co. Pvt. Ltd., 1998.
3. IS: 3370-Indian Standard code of practice for concrete structures for storage of liquids, Bureau of Indian Standards, New Delhi.
4. IS: 11992-1995 "Criteria for design of RCC staging for overhead water tanks", Bureau of Indian Standards, New Delhi.
5.IS: 456-2000 "Indian Standard. Plain and reinforced concrete -. Code of practice. (Fourth Revision)" Bureau of Indian Standards, New Delhi.
6. Indian Standard IS: 4995 - 1974 "criteria for design of reinforced concrete bins for the Storage (Reaffirmed 2003) of Granular and Powdery Materials", Bureau of Indian Standards, New Delhi.
IS: 4995 - 1974 Part I: General Requirements and Assessment of Bin Loads (First Revision) Edition 2.1 (1987-01)
IS: 4995 - 1974 Part II: Design Criteria

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(13CE702) ESTIMATION AND QUANTITY SURVEYING

Objectives:

1. To study estimation of buildings including R.C.C. members
2. To study the estimation of roads covering culverts and bridges
3. To study rate analysis
4. To bring about an exposure to field problems associated with roads/bridge marking and estimation of roadwork quantities

UNIT - I

Procedure of estimating: Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement.

Types of estimates: estimate, preliminary estimate; Plinth area estimate; Cube rate estimate; detailed estimate; revised estimate; Supplementary and revised estimate, Annual repair or maintenance estimate; Contingencies; L.S.Item.

Methods of building estimates: Individual wall method; Centre line method; Arch masonry calculation; Estimating of steps.

Estimate Of Buildings: Estimate of residential building; Estimate of a building from line plan.

UNIT - II

Estimate of RCC works: Standard hooks and cranks; Estimate of RCC roof slab; estimating of RCC beam; RCC T, beam slab and RCC column with foundation.

Road Estimating: Lead and Lift**;** Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections; Estimate of earthwork in hill roads; Estimate of metalled road.

Canal estimate: Earthwork in canals, different cases; Estimate of earthwork in irrigation channels.

UNIT - III

Specifications: Purpose and method of writing specifications; General specifications, general specifications of first class building; Detailed Specifications, Detailed specifications for Brick work; cement concrete; R.C.C; Plastering; Mosaic Flooring; R.R.Stone Masonary; white washing; distempering.

Analysis of Rates: Task or out , turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work: i)cement concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) Cement concrete flooring vi) White washing.vii)earth work excavation.

UNIT - IV

PWD Accounts and Procedure of Works: Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

Valuation: Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for estimating cost depreciation; Valuation of building.

Miscellaneous Topics : Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.

Text Books:

1. Estimating & Costing in Civil Engineering by B.N. Dutta; U. B. S. Publishers & Distributors, New Delhi.
2. Valuation of Real properties by S. C. Rangwala; Charotar Publishing House, Anand.
3. Estimating & Costing in Civil Engineering, V.V.Vazirani and S.P.Chandola, Khanna publishers Delhi.

Reference Books:

1. Civil Estimating, Costing, and Valuation in Civil Engineering, Agarwal, Kumar, Chaudary, Dhanpat Rai Publications.
2. Estimation and costing, G.S.Biridie, Dhanpat Rai Publications.
3. Text book of Estimating and costing, Mahajan UBS Publications.
4. AP Dept, Standard Specifications and Standard schedule of rates, Public work department.

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(13CE703) TRANSPORTATION ENGINEERING-II

Objectives:

Understand the Traffic characteristics and application of Management.

- To have a basic knowledge about railways and railway track design.
- To learn about site selection, lightening system & marking and various components of airport.
- To learn about the structural requirement in ports and harbours.

UNIT - I

Traffic Engineering: Basic Parameters of Traffic, Volume, Speed and Density and their relationships, Traffic Volume Studies, Data Collection and Presentation, Speed studies.

Intersections: Types of Intersections, Conflicts at Intersections, Types of at Grade Intersections, Channelization: Objectives, Traffic Islands and Design criteria, Design of Traffic Signals, Webster Method, IRC Method. Types of Grade Separated Intersections, Rotary Intersection, Concept of Rotary and Design Criteria, Advantages and Disadvantages of Rotary Intersection.

UNIT - II

Introduction to Railway: Permanent way components, Cross Section of Permanent Way, Functions of various Components like Rails, Sleepers and Ballast, Gauge, Creep of Rails, Theories related to Creep, Sleeper density.

Geometric Design of Railway Track: Gradients, Grade Compensation, Cant and Negative Super elevation, Cant Deficiency , Degree of Curve, Points and Crossing, Rail Joints & Welding of Joints.

UNIT - III

Airport Engineering: Airport Site selection , Wind rose diagram ,Runway Orientation , Basic Runway Length , Corrections for Elevation, Temperature , Airport Classification , Factors Controlling Taxiway Layout , Terminal Area , Building and Building Area, Vehicular circulation and Parking Area , Apron , Hangar ,Typical Airport Layouts, Runway Lightening system & Marking.

UNIT - IV

Port and Harbour Engineering: Requirements of Port and Harbour, Classification of Ports & Harbours, Features of a Harbour, Planning of Harbour, Breakwaters, Dry docks and slipways, Quays, Jetties, Wharves, Dolphins, Moorings, Aprons, Transit shed and Warehouses, Navigational aids, Maintenance of Port and Harbours, Dredging.

Text books:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna Publications
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications
3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
4. Satish Chandra and Agarwal, M.M. (2007) "Railway Engineering" Oxford Higher Education, University Press New Delhi.
5. Airport Planning and Design, S.K. Khanna and M.G Arora, Nemchand Bros.

Reference Books:

1. A Text Book of Railway Engineering, S.C.Saxena and S.Arora, Dhanpatrai and Sons, New Delhi.
2. Highway, railway, Airport and Harbour Engineering, K.P. Subramanian.
3. Harbour, Dock and Tunnel Engineering, R. Srinivasan.
4. Dock and Harbour Engineering, Hasmukh P Oza, Gutam H Oza.
5. A Text book of Transportation Engineering, S.P.Chandola, S.Chand & Co. Ltd., (2001).

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(AUTONOMOUS)

IV B.Tech I Semester (CE)	L	T	P	[C]
	3	0	0	[3]

(13CE704) PRESTRESSED CONCRETE

Objectives:

- Distinguish between RCC and PSC members
- Understand principle in various methods of pre stressing systems
- Evaluate the losses in pre and post tensioned members
- Analyze and design members subjected to flexure and shear.

UNIT- I

Introduction: Basic concepts of prestressing; Historical development; Need for High strength steel and high strength concrete; Advantages of prestressed concrete.

Materials For Prestressed Concrete: High strength concrete; High tensile steel.

Prestressing Systems: Tensioning devices; Hoyer's long line system of pretensioning; Post tensioning systems; Detailed study of Freyssinet system , Lee, McCall System and Gifford , Udall system;

Analysis of Prestress and Bending Stresses: Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.

UNIT -II

Losses of Prestress: Nature of losses of prestress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for design.

Deflections Of Prestressed Concrete Members: Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members; Prediction of long term deflections due to creep and shrinkage

UNIT- III

Elastic Design of Prestressed Concrete Sections for Flexure: Permissible compressive stresses in concrete as per IS 1343; Design of rectangular and I-sections of TYPE 1, TYPE 2 (Elastic Design only).

UNIT -IV

Shear Resistance: Shear and Principal Stresses; Ultimate shear resistance of prestressed concrete members; Design of shear reinforcement.

Transfer of Prestress In Pre, Tensioned Members: Transmission of prestressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses.

Text Books:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.
3. Praveen Nagarajan,"Prestressed concrete Design", Pearson Publisher" 2013.

Reference Books:

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.

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IV B.Tech I Semester (CE)	**L**	**T**	**P**	**[C]**
	3	**0**	**0**	**[3]**

(13CE705) EARTH QUAKE ENGINEERING
(Elective-I)

Objectives: The main objective of the course is to introduce dynamic loading and the dynamic performance of the structures to the students. Different types of dynamic loading also to be discussed. The detailed study on the performance of structures under earthquake loading is also one of the focus of the course.

UNIT-I

Theory of Vibrations: Difference between static loading and dynamic loading , Degree of freedom , idealisation of structure as single degree of freedom system , Formulation of Equations of motion of SDOF system , D'Alemberts principles , effect of damping , free and forced vibration of damped and undamped structures , Response to harmonic and periodic forces.

UNIT-II

Multiple Degree of Freedom System: Two degree of freedom system , modes of vibrations , formulation of equations of motion of multi degree of freedom (MDOF) system , Eigen values and Eigen vectors , Response to free and forced vibrations , damped and undamped MDOF system , Modal superposition methods.

UNIT- III

Elements of Seismology: Elements of Engineering Seismology , Causes of Earthquake , Plate Tectonic theory , Elastic rebound Theory , Characteristic of earthquake , Estimation of earthquake parameters , Magnitude and intensity of earthquakes , Spectral Acceleration.

UNIT -IV

Response of Structures to Earthquake: Effect of earthquake on different type of structures , Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading , Pinching effect , Bouchinger Effects , Evaluation of earthquake forces as per IS:1893 , 2002 , Response Spectra , Lessons learnt from past earthquakes.

Text Books:

1. Chopra, A.K., "Dynamics of Structures , Theory and Applications to Earthquake Engineering", 4th Edition, Pearson Education, 2011.
2. Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007.
3. Elementry structural dynamics by Manica Sharma Dhanpatrai Son's.

Reference Books:

1. Biggs, J.M., "Introduction to Structural Dynamics", McGraw Hill Book Co., New York, 1964.
2. Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 2009.
3. Paz, M. and Leigh.W. "Structural Dynamics, Theory & Computation", 4th Edition, CBS Publishers & Distributors, Shahdara, Delhi, 2006.

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IV B.Tech I Semester (CE)

L	T	P	[C]
3	0	0	[3]

(13CE706) ADVANCED FOUNDATION ENGINEERING
(Elective-I)

Objectives: The main objective of the course is to shallow foundations, analysis of R.C.C footings, deep footings, piles etc.,

UNIT-I

Shallow Foundations-I: General requirements of foundations. Types of shallow foundations and the factors governing the selection of a type of shallow foundation. Bearing capacity of shallow foundations by Terzaghi's theory and Meyerhof's theory (derivation of expressions and solution to problems based on these theories). Local shear and general shear failure and their identification.

Shallow Foundations-II: Bearing capacity of isolated footing subjected to eccentric and inclined loads. Bearing capacity of isolated footing resting on stratified soils, Button's theory and Siva Reddy analysis.

UNIT-II

Analysis and Structural Design of R.C.C. Footings: Analysis and structural design of R.C.C. Isolated, combined and strap footings.

Deep Foundations-I: Pile foundations, types of pile foundations. Estimation of bearing capacity of pile foundation by dynamic and static formulae. Bearing capacity and settlement analysis of pile groups. Negative skin Friction, Pile load tests.

UNIT-III

Deep Foundations-II: Well foundations, elements of well foundation. Forces acting on a well foundation. Depth and bearing capacity of well foundation. Design of individual components of well foundation (only forces acting and principles of design). Problems associated with well sinking.

Sheet Pile Walls: Cantilever sheet piles and anchored bulkheads, Earth Pressure diagram, Determination of depth of embedment in sands and clays, Timbering of Trenches, Earth Pressure Diagrams, Forces in struts.

UNIT-IV

Foundations in Problematic Soils: Foundations in black cotton soils, basic foundation problems associated with black cotton soils. Lime column techniques, Principles and execution. Use of Cohesive Non Swelling (CNS) layer below shallow foundations.

Design of Under Reamed Piles Foundations: Under reamed piles, principle of functioning of under reamed pile, Analysis and structural design of under reamed pile.

Text Books:

1. Analysis and Design of Foundations and Retaining Structures, Shamsher Prakash, Gopal Ranjan and Swami Saran.
2. Foundation Design, Teng.
3. Geotechnical Engg. , C.Venkataramaiah.
4. Geo technical engineering by V.N.S.Murthy, CRC Press, New Delhi.
5. Design of Reinforced concrete Foundations by P.C. Varghese, PHI Publications, New Delhi.

Reference Books:

1. Analysis and Design of Foundations, E.W.Bowles.
2. Foundation engineering by Brije.M.Das, Cengage pubilications, New Delhi.
3. Foundations Design and Construction, Tomlinson.

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IV B.Tech I Semester (CE)

L	T	P	[C]
3	0	0	[3]

(13CE707) REPAIR AND REHABILITATION OF STRUCTURES
(Elective-I)

Objectives:

To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

UNIT- I

Maintenance and Repair Strategies: Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT- II

Strength and Durability of Concrete: Quality assurance for concrete , Strength, Durability and Thermal properties, of concrete , Cracks, different types, causes , Effects due to climate, temperature, Sustained elevated temperature, Corrosion , Effects of cover thickness.

UNIT -III

Techniques for Repair and Protection Methods: Non, destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques , Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT -IV

Repair, Rehabilitation and Retrofitting of Structures: Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake , Demolition Techniques , Engineered demolition methods, Jacketing and fiber raping ,Case studies.

Text Books:

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987.

Reference books:

1. Shetty M.S., "Concrete Technology, Theory and Practice", S.Chand and Company, 2008.
2. Dov Kominetzky.M.S., “ Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001.
3. Ravishankar.K., Krishnamoorthy.T.S, " Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
4. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa

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(AUTONOMOUS)

IV B.Tech I Semester (CE)	L	T	P	[C]
	3	0	0	[3]

(13CE708) WATER RESOURCES SYSTEMS
(Elective-I)

UNIT – I

Introduction: concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimization models, objective function and constraints, types of optimization techniques.

Linear programming –I: Formulation linear programming models, graphical method, simplex method, application of linear programming in water resources.

UNIT – II

Linear programming – II: Revised simplex method, duality in linear programming, sensitivity and past optimality analysis.

Dynamics programming: Belman's of principles of optimality forward and backward recursive dynamic programming, case of dimensionality, application of dynamic for resource allocation.

UNIT – III

Non-linear optimatization techniques: Clerical of method optimization, Kuch-Tucleer, gradential based research techniques for simple unconstrained optimization.

Simulation: application of simulation techniques in water resources.

UNIT – IV

Water –resources economics: Principles of Economics analysis benefit cost analysis socio economic intuitional and pricing of water resources.

Water resources management: Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and subsurface water resources.

Text Books:

1. Water Resources System Analysis – Vedula & Mujumdar – Tata Mc.Graw Hill Company Ltd. 2005.
2. Water Resources Economics - James & Lee. Oxford Publishers 2005.

Reference Books:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.

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(AUTONOMOUS)

IV B.Tech I Semester (CE)	L	T	P	[C]
	3	0	0	[3]

(13CE709) AIR POLLUTION AND CONTROL
(Open Elective)

OBJECTIVES:

- Studying Air Pollution – Definitions, Scope, Significance and Episodes etc.
- Studying Thermodynamics and Kinetics of Air-pollution
- Studying Meteorology and plume Dispersion

UNIT – I

Introduction : Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources.

Effects of Air Pollution: Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT-II

Thermodynamic of Air Pollution: Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like Sox, Nox, CO, HC etc., air-fuel ratio. Computation and Control of products of combustion.

Plume Behaviour : Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

UNIT-III

Pollutant Dispersion Models : Lapse Rates, Pressure Systems, Winds and moisture plume behavior and plume Rise Models; Gaussian Model for Plume Dispersion.

Control of Particulates : Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control, Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

UNIT – IV

Control of Gaseous Pollutants: General Methods of Control of Nox and Sox emissions – In-plant Control Measures, process changes, dry and wet methods of removal and recycling.

Air Quality Management: Air Quality Management – Monitoring of SPM, SOx; NOx and CO Emission Standards– Air sampling – Sampling Techniques – High volume air sampler – Stack sampling - Analysis of Air pollutants – Air quality standards – Air pollution control act.

Text Books:

1. Air pollution By M.N.Rao and H.V.N.Rao – Tata Mc.Graw Hill Company.
2. Air Quality by Thod godish, Levis Publishers, Special India Edition, New Delhi
3. Air pollution by Wark and Warner.- Harper & Row, New York.

Reference Books:

1. An introduction to Air pollution by R.K. Trivedy and P.K. Goel, B.S. Publications.
2. Air Pollution and Control by K.V.S.G.Murali Krishna, Kousal & Co. Publications, New Delhi.
3. Enivronmental meteorology by S.Padmanabham murthy , I.K.Internationals Pvt Ltd,New Delhi.

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IV B.Tech I Semester (CE)	L	T	P	[C]
	3	0	0	[3]

(13CE710) REMOTE SENSING AND GIS
(Open Elective)

Objectives:

The application of special information products particularly derived from Remote Sensing Satellites to various areas of management, planning and development has been highly rewarding. The use of Remote Sensing and GIS Technology has opened the door for immense opportunities in large scale mapping, updating existing maps and practical planning and decision making. This phenomenal growth in the field of RS & GIS is due to successful launching of a series of state of art satellites in India. The present course is designed to provide the basic concepts of RS & GIS and their application in Civil Engineering field.

Outcomes:

The present course is an introductory course in RS & GIS. The course is designed in such a way has to provide some of basics required for civil engineering and to solve the civil engineering problems.

UNIT – I

Introduction: remote sensing: Applications and importance of remote sensing, GPS: Available GPS net works, Limitations and applications of GPS; GPS receivers.

Remote Sensing – I: Basic concepts and fundamentals of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units, over view of Indian Remote sensing satellites and sensors.

UNIT – II

Remote Sensing – II: Energy resources, energy interactions with earth surface features and atmosphere, resolution, visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

UNIT – III

Types of data representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS - Advantages and disadvantages. File management, Spatial data – Layer based GIS, Feature based GIS mapping.

GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT – IV

Applications of GIS: Application areas and user segments; Guide lines for preparation of GIS; Applications of GIS for land use and housing management; Assessment of physical transformation in an urban area.

Water Resources Applications: Land use/Land cover in water resources, Surface water mapping and inventory, Watershed management for sustainable development . Reservoir sedimentation, Ground Water Targeting, Identification of sites for artificial Recharge structures.

Text Books:

1. Remote Sensing and its applications by LRA Narayana University Press 1999.

2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.

Reference Books:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy , B.S.Publications.
3. GIS by Kang – tsung chang, TMH Publications & Co.,
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
5. Fundamental of GIS by Mechanical designs John Wiley & Sons.

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IV B.Tech I Semester (CE)	**L**	**T**	**P**	**[C]**
	3	**0**	**0**	**[3]**

(13CE711) DISASTER MANAGEMENT AND MITIGATION
(Open Elective)

UNIT-I

Concept of disaster management. Types of disasters. Disaster mitigating agencies and their organization structure at different levels. Overview of Disaster situations in India: Vulnerability profile of India and vulnerability mapping including disaster prone areas, communities and places.

UNIT-II

Disaster preparedness, ways and means; skills and strategies; rescue, relief, reconstruction and rehabilitation.

UNIT-III

Seismic vulnerability of urban areas. Seismic response of R.C frames buildings with soft first storey. Preparedness for natural disasters in urban areas. Preparedness and planning for an urban earthquake disaster. Urban settlements and natural hazards. Tsunami and its impact.

UNIT-IV

Landslide hazards zonation mapping and geo, environmental problems associates with the occurrence of landslides. A statistical approach to study landslides. Land causal factors in urban areas organization of mockdrills.

Text Books:

1. “Natural Hazards in the urban habitat” by lyengar, CBRI, Tata McGraw Hill.
2. “Natural Disaster management”, Jon Ingleton (Ed), Tulor Rose, 1999
3. “Disaster Management”, RB Singh (Ed), Rawat Publications, 2000.
4. Anthropology of Disaster management”, Sachindra Narayan, Gyan Publishing house, 2000.

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IV B.Tech I Semester (CE)

L	T	P	[C]
0	0	3	[2]

(13CE712) COMPUTER AIDED STRUCTURAL ANALYSIS AND DESIGN LAB

A minimum of twelve (12 No.) shall be done and recorded
Students are required to analyze and design the following structures using software package like STAAD Pro/STRUDS/GTSTRUDL/STRAP etc.

UNIT-I

Introduction to Civil Engineering Softwares: Introduction to civil engineering softwares: Analysis and design-Softwares-RCC-Steel-Storage Tanks etc., Estimation and costing softwares, Construction management softwares and Spread sheets and its applications in civil engineering.

(At least **Six** of the following) 4 lab classes

1. Analysis of simply supported continuous beam.
2. Analysis and design of fixed end supported continuous beam.
3. Analysis of single storey unsymmetrical portal frame
4. Analysis of plane frame subjected to gravity loading.
5. Analysis of plane frame subjected to gravity loads and lateral load (wind load)
6. Analysis of plane roof truss (DL+LL).
7. Analysis of plane roof truss (DL+WL).

UNIT-II

(At least **five** of the following)

1. Design of one,way slab.
2. Design of two way slab
3. Design of Isolated footing.
4. Design of Combined footing.
5. Design of Raft footing.
6. Design of Pile foundation .

UNIT-III

(At least one of the following)

1. Analysis and design of two storied R.C.C.Framed building.
2. Analysis and design of Industrial steel building.

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IV B.Tech I Semester (CE)	L	T	P	[C]
	0	0	3	[2]

(13CE713) IRRIGATION DESIGN PRACTICE LAB

Objectives:

- To know the importance, location, components and types of irrigation structures.
- To learn the procedure to design the irrigation structures.
- To get experience in drawing the irrigation structures.

Design & Drawing of the following:

UNIT-I

1. Surplus weir.
2. Canal drop, Notch type.
3. Canal cross regulator.

UNIT-II

1. Direct sluice.
2. Vertical drop weir.
3. Syphon Aqueduct (Type, III).

Note:

Two questions of 35 marks each will be given from each unit out of which one is to be answered.

Text Books:

1. Design of Minor Irrigation and Canal Structures by C. Satyanarayana Murthy; Wiley Eastern Ltd., New Delhi. 2006.

Reference Books:

1. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi, 2006.

Web References: NPTEL

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IV B.Tech I Semester (CE)	**L**	**T**	**P**	**[C]**
	0	**0**	**0**	**[2]**

(13CE714) FIELD TRAINING AND SURVEY CAMP

Survey camp for a duration of two weeks to be conducted before the commencement of III B.Tech I Semester class work, ie after II B.Tech II Semester or before the commencement of IV B.Tech I Semester class work, ie after III B.Tech II Semester. Theodolite, cross staff, levelling staff, tapes, plane table, total station and other required survey instruments may be used for the survey camp. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots of:

(i) Triangulation
(ii) High way alignment
(iii) Water supply project
(iv) Contouring
(v) Trigonometric survey
(vi) Total station
(vii) Use of GPS to determine latitude and longitude

EVALUATION PROCEDURE: Total: 100 marks

1. Internal Marks: 30 marks (decided by the staff in-charge appointed by the Institution)
2. External Marks: 70 marks
   a. Evaluation of Survey Camp Report: 30 marks (HOD-10, Internal Examiner-10, External Examinar-10)
   b.Viva voce examination: 40 marks (Evaluated by the external examiner-20 and HOD-20)

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IV B.Tech I Semester (CE)	L	T	P	[C]
	0	0	2	[2]

(13CE715) PROJECT WORK PHASE-I

The object of Project Work Phase-I is to enable the student to take up investigative study in the broad field of his branch of Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or three/four students in a group under the guidance of a supervisor/ guide. This is expected to provide a good initiation for the student(s) in R&D work.

The assignment normally includes:

- Survey and Study of published literature of on the assigned topic.
- Working out a preliminary approach to the problem relating to the assigned topic.
- Conducting preliminary analysis/ modeling/simulation/experiment/ design/ feasibility.
- Preparing a written report on the study conducted for presentation to the department.
- Final seminar presentation before Project Review Committee.

The supervisor/ guide will evaluate the execution of the project periodically.
Project Work Phase-I is allocated 100 marks with 2 credits. Out of 100, 25 marks are allocated for the supervisor/guide to be awarded based on periodical project reviews and submission of the report on the work done. 25 marks are allocated for the supervisor/guide and head of the department to be awarded based on seminar given by each student on the topic of the project. The other 50 marks shall be awarded on the basis of his presentation on the work done on his project by the Departmental committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.
The candidate is declared to have passed in Project work Phase-I when he gets 40% marks given by the Departmental Committee and 50% marks overall.

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IV B.Tech II Semester (CE)	**L**	**T**	**P**	**[C]**
	3	**1**	**0**	**[3]**

(13CE801) FUNDAMENTALS OF FINITE ELEMENTS METHODS IN CIVIL ENGINEERING

Objectives:

To apprise the students about the basics of Finite Element theory, computer implementation of this theory and its practical applications.

UNIT-I

Introduction: Concepts of FEM , Steps involved merits & demerits, energy principles, Discretization, Rayleigh, Ritz method of functional approximation.

Principles of Elasticity: Equilibrium equations , strain displacement relationships in matrix form , Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT -II

One Dimensional Elements: Stiffness matrix for bar element, shape functions for one dimensional element , one dimensional problem.

Two Dimensional Elements: Different types of elements for plane stress and plane strain analysis , Displacement models , generalized coordinates , shape functions , convergent and compatibility requirements , Geometric invariance , Natural coordinate system , area and volume coordinates.

UNIT-III

Generation of Element: Generation of element stiffness and nodal load matrices for 3 node triangular element and four noded rectangular elements.

Isoparametric formulation : Concepts of isoparimetric elements for 2D analysis ,formulation of CST element, 4 Noded and 8 noded isoparimetric quadrilateral elements , Lagrangian and Serendipity elements.

UNIT-IV

Axi-symmetric Analysis: Basic principles, Formulation of 4, noded iso-parametric, axi-symmetric element.

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

Text Books:

1. Finite Elements Methods in Engineering by Tirupati. R. Chandranpatla and Ashok D. Belegundu, Pearson Education Publications.
2. Finite element analysis by S.S. Bhavakatti, New age international publishers 3.Finite Element methods for Engineers by U.S.Dixit, Cengage Publishers, New Delhi.
3. Finite element analysis in Engineering Design by S.Rajasekharan, S.Chand Publications, New Delhi.
4. Finite Element analysis, Theory & Programming by C.S.Krishna Murthy, Tata Mc.Graw Hill Publishers

Reference Books:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons.
2. Finite element analysis by David V Hutton, Tata Mcgraw Hill, New Delhi.
3. Applied Fem by Ramamurthy, I.K.International Publishers Pvt Ltd., New Delhi.
4. Fem by J.N.Reddy, McGraw, TMH Publications, New Delhi.

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IV B.Tech II Semester (CE)	L	T	P	[C]
	3	0	0	[3]

(13CE802) BRIDGE ENGINERING
(Elective-II)

Objectives: To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for given site conditions.

UNIT I

Introduction: History of Bridges , Components of a Bridge and its definitions, Classification of Road Bridges , Selection of Site and Initial Decision Process , Survey and Alignment; Geotechnical Investigations and Interpretations. River Bridge: Selection of Bridge site and planning , Collection of Bridge design data , Hydrological calculation

Road Bridges , IRC codes , Standard Loading for Bridge Design , Load combinations for different working state and limit state designs Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre design considerations; Railroad vs. Highway bridges.

UNIT II

Deck Slab Bridge: Introduction – Effective width method of Analysis Design of deck slab bridge (Simply supported) subjected to class AA Tracked Vehicle only.

Beam & Slab Bridge (T-Beam Bridge): General features – Design of interior panel of slab – Pigeauds method –Design of a T-beam bridge subjected to class AA tracked vehicle only.

UNIT III

Box Culvert: General aspects. Design loads, Design of Box culvert subjected to RC class AA tracked vehicle only.

Plate Girder Bridge: Introduction – elements of a plate girder and their design. Design of a Deck type welded plate girder – Bridge of single line B.G.

UNIT IV

Substructure, Bearings and Deck Joints, Parapets and Railings: Substructure **,** Pier; Abutment , Wing walls, Importance of Soil, Structure Interaction , Types of foundations, Open foundation, Pile foundation, Well foundation, Simply supported bridge, Continuous Bridge , Bearings and Deck Joints , Different types of bridge bearings and expansion joints , Parapets and Railings for Highway Bridges.

Text Books:

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
2. Jagadeesh .T.R. and Jayaram.M.A. "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013.

Reference Books:

1. Phatak D.R., “Bridge Engineering”, Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S., “Bridge Engineering”, Tata McGraw Hill, New Delhi, 1996.
3. Rajagopalan. N. “Bridge Superstructure”, Alpha Science International, 2006.

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IV B.Tech II Semester (CE)	L	T	P	[C]
	3	0	0	[3]

(13CE803) GROUND IMPROVEMENT TECHNIQUES
(Elective-II)

UNIT - I

Ground Improvement: Definition, Objectives of ground improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique. Ground modification for Black Cotton soil.

Compaction: Effect of grain size distribution on compaction for various soil types like lateritic soil, coarse-grained soil and micaceous soil. Effect of compaction on engineering behaviour like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type. Specification of compaction. Tolerance of compaction. Shallow and deep compaction, Dynamic Compaction, Vibrofloatation.

UNIT - II

Hydraulic Modification: Definition, Principle and techniques. gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations. Design of dewatering system including pipe line effects of dewatering.

Drainage and Preloading: Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.

UNIT - III

Chemical Modification-I: Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash.

Chemical Modification-Ii: Lime stabilization – suitability, process, criteria for lime stabilization. Other chemicals like chlorides, hydroxides, lignin and hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.

UNIT - IV

Grouting: Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.

Miscellaneous Methods: (ONLY CONCEPTS & USES): Soil reinforcement, Thermal methods, Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing. Stone Column, Micropiles.

Text Books:

1. Ground Improvement Techniques- Purushothama Raj P.(1999) Laxmi Publications, New Delhi.
2. Construction and Geotechnical Method in Foundation Engineering- Koerner R.M. (1985) - Mc Graw Hill Pub. Co., New York.

Reference Books:

1. Engineering principles of ground modification- Manfred Hausmann (1990) - Mc Graw Hill Pub. Co., New York.
2. Methods of treatment of unstable ground- Bell, F.G. (1975) Butterworths, London.

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	3	1	0	[3]

(13CE804) ENVIRONMENTAL IMPACT ASSESMENT AND MANAGEMENT (Elective-II)

OBJECTIVES:

- Studying Basic concept of EIA, E I A Methodologies
- Studying Impact of Developmental Activities and Land use
- Studying Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation

UNIT – I

Introduction : Basic concept of EIA - Initial environmental examination -Elements of EIA - Factors affecting EIA - Impact evaluation and analysis - Preparation of environmental base map - Classification of environmental parameters.

EIA Methodologies: Criteria for the selection of EIA Methodology – EIA methods - Adhoc methods, matrix methods, network method - Environmental medium quality index method, overlay methods and cost/benefit analysis.

UNIT – II

Environmental Impact on Soil and Ground Water: Prediction and assessment - Soil quality - Methodology for the assessment of soil and groundwater - Delineation of study area - Identification of activities.

Environmental Impact Assement of Surface Water and Air: Impact prediction - Assessment of impact significance - Identification and incorporation of mitigation measures - EIA in surface water, air and biological environment: Methodology for the assessment of impacts on surface water environment - Air pollution sources - Generalized approach for assessment of air pollution Impact.

UNIT – III

Assement of Impact on Vegetation and Wildlife: Assessment of impact of developmental activities on vegetation and wildlife - Environmental impact of deforestation – Causes and effects of deforestation.

Environmental Audit: Environmental audit and environmental legislation - Objectives of environmental audit - Types of environmental audit - Audit protocol - Stages of environmental audit -Onsite activities - Evaluation of audit data and preparation of audit report.

UNIT-IV

Environmental Acts: Post audit activities - The Environmental protection act - The water act - The air act - Wild life act.

Case Studies: Case studies and preparation of environmental impact assessment statement for various industries.

Text Books:

1. Y. Anjaneyulu, Environmental Impact Assessment Methodologies, 2nd Edition, B.S. Publications, Hyderabad, 2010.
2. J. Glynn and Gary W. Heinke, Environmental Science and Engineering, 2nd Edition, Prentice Hall Inc., 1996.

Reference Books:

1. Suresh K. Dhameja, Environmental Engineering and Management, S.K. Kataria and Sons, New Delhi, 2010.
2. H.S. Bhatia, A Text Book of Environmental Pollution and Control, Galgotia Publication (P) Ltd., Delhi, 2003.

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	3	1	0	[3]

(13CE805) HYDRO POWER ENGINEERING
(Elective-II)

UNIT - I

Hydropower : Introduction to water power - Hydropower development - Sources of energy - Estimation of water power potential - Load curve - Load factor – Capacity factor - Utilization factor - Diversity factor - Load duration curve - Firm power - Secondary power - Prediction of load.

Water Power Estimate: Collection and analysis of stream flow data – Mass curve – Flow duration curves – Construction and utility of these curves – Effect of storage and pondage – Estimates of available water power.

UNIT - II

Hydropower Plants: Low and high head plants: classification of hydel plants - Run-off- river plants - General arrangement of run-off-river plants - Valley dam plants - Diversion canal plants - High head diversion plants - Storage and pondage.

Pumped Storage Power Plants: Basic features - Advantages of pumped, storage plants - Types of pumped storage plants - Relative merits of two-unit and three unit arrangement.

UNIT - III

Hydraulic Turbines : Classification of turbines – Francis, Kaplan and Pelton turbines – Component parts and their function – Draft tubes and their theory – Similarity laws and specific speed unit, quantities – Performance curves – Governing of turbines – Selection of turbines – Cavitation in turbines.

Water Conveyance: Classification of penstocks - Design criteria- Economical diameter – Anchor blocks - Conduit valves - Bends and manifolds.

UNIT - IV

Channel Surges And Intakes: Water Hammer - Resonance in Penstocks - Channel surges - Surge tanks-types of valves and their importance - Intakes - Types - Losses- Air entrainment - Inlet aeration - Canals - Forebay – Tunnels – Selection of turbines.

Power House And Equipment: Location of power house – General arrangement of hydroelectric unit – Number and size of units – Power house sub structure – Pumped storage plant.

Text Books:

1. M.M. Dandekar and K.N. Sharma, *Water Power Engineering,* Vikas Publishing House Pvt. Ltd., India, 2007

2. R.K. Sharma and T.K. Sharma, *A Text Book of Water Power Engineering,* S. Chand Company, NewDelhi, 2008.

Reference Books:

1. B. C. Punmia, B. B. Pande Lal, Ashok Kumar Jain and Arun Kumar Jain, Irrigation and Water Power Engineering, Laxmi Publications, New Delhi, 2009.
2. P.N. Modi, Irrigation Water Resources and Water Power Engineering, 7th Edition, Standard Book House, 2008.
3. K.R. Arora, Irrigation, Water Power and Water Resources Engineering, 4th Edition, Standard Publishers Distributors, Delhi, 2011.
4. Deshmukh, Water Power Engineering, Dhanpat Rai and Sons, New Delhi.

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(13CE806) GROUND WATER DEVELOPMENT AND MANAGEMENT
(Elective-III)

UNIT- I

Introduction: Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

Ground Water Movement: Permeability, Darcy's law, storage coefficient, Transmissivity, differential equation governing ground water flow in three dimensions derivation, Ground water flow contours their applications.

UNIT-II

Analysis of Pumping Test Data: i.) Steady flow towards a well in confined and unconfined aquifers – Dupit's and Theim's equations, Assumptions, Formation constants, yield of an open well interface and well tests. ii) Unsteady flow towards a well – Non equilibrium equations – Theis solution – Jocob and Chow's simplifications, Leaky aquifers.

UNIT-III

Surface and Subsurface Investigation: Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

Artificial Recharge of Ground Water: Concept of artificial recharge – recharge methods, relative merits. Applications of GIS and Remote Sensing in Artificial Recharge of Ground water along with Case studies.

UNIT-IV

Ground water modeling: Governing equations for flow and transport, Numerical simulation using FDM.

Saline Water Intrusion in aquifer: Occurrence of saline water intrusions, Ghyben-Herzberg relation, Shape of interface, control of seawater intrusion.

Groundwater Basin Management: Concepts of conjunction use, Case studies.

Text Books:

1. Groundwater by H.M. Raghunath, Wiley Eastern Ltd.
2. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York

Reference Books:

1. Groundwater by Bawvr, John Wiley & sons.
2. Groundwater Syatem Planning & Managemnet – R. Willes & W.W.G. Yeh, Printice Hall.

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	3	0	0	[3]

(13CE807) CONSTRUCTION PROJECT MANAGEMENT
(Elective-III)

Objectives: To make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool.

UNIT-I

Fundamentals of Construction Technology: Definitions and discussion , construction activities , construction processes , construction works , construction estimating , construction schedule , productivity and mechanized construction , construction documents , construction records , quality , safety , codes and regulations.

Planning and Implementation at Layouts: Project site; development , setting out; site layout , infrastructure development , construction methods , construction materials , deployment of construction equipment(including concreting and hoisting equipment also) , prefabrication in construction ,false work and temporary works.

UNIT-II

Earth Work:

Mechanized Excavation: Classification of soil; mechanized excavation, groundwater control, trenchless (no, dig) technology, grading, dredging.

Excavation by Blasting: Rock excavation , basic mechanics of breakage , blasting theory , drillability of rocks , kinds of drilling , selection of the drilling method and equipment , explosives , blasting patterns and firing sequence , smooth blasting , environmental effect of blasting.

UNIT-III

Project Management:

Bar Charts and Milestone Charts : Introduction , project planning , scheduling , controlling , role of decision in project management , techniques for analyzing alternatives operation research , methods of planning and programming problems , development of bar chart , illustrative examples , shortcomings of bar charts and remedial measures , milestone charts

Elements of Network and Development of Network : Introduction , event , activity , dummy , network rules , graphical guidelines for network , common partial situations in network , numbering the events , cycles problems , planning for network construction ,steps in development of network , work breakdown structure ,hierarchies , illustrative examples

UNIT-IV

Crashing of Networks: Introduction, project cost, indirect project cost, direct project cost, slope of direct cost curve, total project cost and optimum durations, steps in cost optimization, illustrative examples

Resource Allocation: Introduction, resource histograms, resource smoothing, resource leveling.

Text Books:

1. Construction Technology by Subir K.Sarkar and Subhajit Saraswati, Oxford Higher Education, Univ.Press, Delhi.
2. Project Planning and Control with PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications, New Delhi.
3. Construction project management by Jha, Pearson publications, New Delhi.

Reference Books:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.
2. Operations research by P.Sankar Iyer, TMH Publications, New Delhi.
3. Operations research by N.Ramanathan, TMH Pubilications, New Delhi.
4. Total Project management, the Indian context, by: P.K.JOY, Mac Millan Publishers India Limited.

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	3	0	0	[3]

(13CE808) EXPERIMENTAL STRESS ANALYSIS
(Elective-III)

Objectives: To make students aware of various measurement techniques and experimental planning and procedures adopted in laboratory.

UNIT - I

Strain Gauges: Definition of Gauge length, sensitivity and range , Characteristics of an ideal strain gauge , Different types of mechanical strain gauges for use in metal and concrete specimens , Optical strain gauge , Acoustic strain gauge , Pneumatic strain gauge , Merits and demerits.

UNIT- II

Electrical Strain Gauges: Inductance, capacitance and piezo, electric gauges, Bonded and unbounded resistance gauges and their application in stress analysis , Fixing technique and measurement of strains , Rosettes , Determination of principal strains using rosettes , Use of Murphy' s construction for drawing circle of strains , Mohr' s stress circle , Analytical solution.

UNIT - III

Photo Elasticity: Principles , Maxwell' s stress optic law , Plane and circularly polarised light and their use in photo elasticity , Polariscopes , Diffusion type, lense type and reflection type polariscopes , Isochromatics and Isoclinics , Model materials , Calibration methods for finding material fringe value , Model fringe value , Examples of beam flexure and diametrically loaded circular plates.

UNIT - IV

Model Analysis: Direct and indirect models , Laws of structural similitude , Choice of scales , Limitation of model studies , Buckingham piktheorem , Dimensional analysis , Model materials , Begg"s deformeter and its use in model analysis , Simple design of models for direct and indirect model analysis.

Text Books:

1. T.K.Roy, "Experimental Analysis of Stress and Strains", S.Chand and Company Ltd., New Delhi, 2000.
2. Hetenyi. M., Hand Book of Experimental Stress Analysis, John Wiley and Sons Inc., New York, 1966.

Reference Books:

1. J.W.Dally and W.F.Riley, "Experimental Stress Analysis", McGraw Hill Book, New York, 1990.
2. L.S. Srinath, "Experimental Stress Analysis", Tata, McGraw Hill Book Company, New Delhi, 2001.
3. Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 2004.

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	3	0	0	[3]

(13CE809) PAVEMENT ANALYSIS AND DESIGN
(Elective-III)

Objectives:

Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, he/she will be in a position to assess quality and serviceability conditions of roads.

UNIT-I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types and Articulated Commercial Vehicles, Legal Axle, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Lane Distributions & Vehicle Damage Factors, CBR and plate bearing tests, Resilient Modulus, fatigue tests on bitumen mixes.

UNIT-II

Stresses in Flexible Pavements: Stress Inducing Factors in Flexible pavements; Stress In Flexible Pavements: Visco Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts.

UNIT-III

Stresses in Rigid Pavements: Westergaard's Theory and Assumptions, Stresses and Deflections due to temperature and Loading, Frictional Stresses, calculation of stresses using Picket and Ray charts.

UNIT-IV

Design of Flexible and Rigid Pavements: Design Concepts, Stepwise procedure for design of Flexible and Rigid pavement as per IRC and AASTHO guidelines. Design of bitumen pavement Overlays as per IRC 81 & FWD,(SP) procedure, Design of rigid overlays as per IRC SP76,2008 guidelines.

Text Books:

1. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.
2. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc.
3. IRC: 37, 2012 Tentative Guidelines for the Design of Flexible Pavements.
4. IRC: 58, 2011 Guidelines for Design of Plain Jointed Rigid Pavements for Highways.
5. AASHTO: Design of Pavement Structures, 1993.

Reference Books:

1. Concrete Pavements, A F Stock, Elsevier, Applied Science Publishers.
2. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications

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IV B.Tech II Semester (CE)	L	T	P	[C]
	0	0	0	[2]

(13CE810) COMPREHENSIVE VIVA-VOCE

There shall be a Comprehensive Viva-Voce in IV B.Tech II Semester. The comprehensive Viva-Voce shall be evaluated in the topics covering the core aspects of the concerned discipline in which the candidate is likely to get graduated. The marks can be awarded based on the performance in viva-voce examination conducted by a committee consisting of **i)** Head of the Department **ii)** Two Senior Faculty members of the department **iii)** External Examiner appointed by the Principal. The comprehensive Viva-Voce shall be conducted for 100 marks. Of the 100 marks, 25 marks are allocated to each member of the committee.

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	0	0	0	[10]

(13CE811) PROJECT WORK PHASE-II

The Project work Phase-II will be an extension of Phase-I project work. The object of Project work phase-II is to enable the student to extend further the investigative study taken up as the project in Phase-I under the guidance of the supervisor/ guide from the department.

The assignment normally includes:

- Preparing an action plan for conducting the investigation including the team work.
- In depth study of the topic assigned.
- Review and finalization of the approach to the problem relating to the assigned topic.
- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Internal: Project Work Phase-II is allocated 50 internal marks. Out of 50, 25 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 25 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

External: The semester end examination for project work done during IV B.Tech I semester and IV B.Tech II semester for 150 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the II Semester of IV B.Tech. The above committee evaluates the project work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/Supervisor respectively for a total of 100marks. Of the 50 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 40 marks. The evaluation of 150 marks is distributed as given below:

A candidate shall be declared to have passed in project work phase-II if he secures a minimum of 50% aggregate marks (100 marks) (Internal marks + External project marks), subject to a minimum of 40% marks (60 marks) in the project end examination.