

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA
VIZIANAGARAM-535 003, A.P
(Established by Andhra Pradesh Act No.22 of 2021)

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Academic Regulations (R23) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year **2023-24** onwards)

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Academic Regulations (R23) for B.Tech.(Lateral Entry Scheme)

(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year 2024 - 25 onwards)



Academic Regulations (R23) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from
the Academic Year **2023-24** onwards)

1. **Award of the Degree**
   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
      (i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
      (ii) Registers for 160 credits and secures all 160 credits.

   (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
      (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.
      (ii) Registering for Honors is optional.
      (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

3. **Admissions**
   Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. **Program related terms**
   Credit: A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

   Credit Definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

a) ***Academic Year:*** Two consecutive (one odd + one even) semesters constitute one academic year.

b) ***Choice Based Credit System (CBCS):*** The CBCS provides a choice for students to select from the prescribed courses.

5. Semester/Credits:

i) A semester comprises 90 working days and an academic year is divided into two semesters.

ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.

iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. Course Classification:

All subjects/ courses offered for the undergraduate programme in Engineering & Technology (B.Tech. degree programmes) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes subjects related to the parent discipline/department/branch of Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners

8. Programme Pattern

i. Total duration of the of B. Tech (Regular) Programme is four academic years.
ii. Each academic year of study is divided into two semesters.
iii. Minimum number of instruction days in each semester is 90 days.
iv. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
v. Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.
vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.

ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.

x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.

xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.

xv. Undergraduate degree with Honors is introduced by the University for the students having good academic record.

xvi. Each college shall take measures to implement Virtual Labs (https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xvii. Each college shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.

xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

9. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship &Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

Theory Courses

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
ii) For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.
iii) If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.
iv) If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

a) Continuous Internal Evaluation

i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
ii) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted by the respective institution on the day of subjective paper test.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the

units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25
Marks obtained in second mid: 20
Final mid semester Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent
Marks obtained in second mid: 25
Final mid semester Marks: (25x0.8) + (0x0.2) =20

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.
ii) Question I shall contain 10 compulsory short answer questions for a total of 20marks such that each question carries 2 marks.
iii) There shall be 2 short answer questions from each unit.
a) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
iv) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical &Electronics Engineering shall have the following pattern:

i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.
iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

Practical Courses

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

b) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.

c) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.

d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.
- Procedure: 20 marks
- Experimental work & Results: 30 marks
- Viva voce: 20 marks.

In a practical subject consisting of two parts (Eg: Basic Electrical &Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.

e) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.

Assessment Method	**Marks**
Continuous Internal Assessment	30
Semester End Examination	70
Total	**100**

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing , multiple branches, etc is mentioned along with the syllabus.

f) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-

examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

g) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

10. Skill oriented Courses

i) There shall be five skill-oriented courses offered during III to VII semesters.

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.

iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.

v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the University at the beginning of the semester. The principal of the respective college shall forward such proposals to the University for approval.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the University.

11. Massive Open Online Courses (MOOCs):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the University. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

12. Credit Transfer Policy

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
viii) Student pursuing courses under MOOCs shall acquire the required credits only

after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

ix) The institution shall submit the following to the examination section of the university:
   a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
   b) Undertaking form filled by the students for credit transfer.

x) The universities shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the University from time to time.

13. Academic Bank of Credits (ABC)

The University has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i. provide option of mobility for learners across the universities of their choice
ii. provide option to gain the credits through MOOCs from approved digital platforms.
iii. facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv. execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

14. Mandatory Internships

Summer Internships : Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage

each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

Full Semester Internship and Project work: In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the University and is evaluated for 140 marks.

The college shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

15. Guidelines for offering a Minor

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

i) The Minor program requires the completion of 12 credits in Minor stream chosen.
ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.
iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor by opting for the courses offered through various verticals/tracks under Open Electives.

16. Guidelines for offering Honors

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a

specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
ii) A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.
iv) The concerned Principal of the college shall arrange separate class work and timetable of the courses offered under Honors program.
v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
vi) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.
vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.
x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors:

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline
ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.
iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
v) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors:

i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
iv) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

17. Attendance Requirements:

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the University.
iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.
vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

18. For induction programme attendance shall be maintained as per AICTE norms.
Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) up to in the subjects that have been studied up to III semester.

iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any ***decimal*** fraction should be ***rounded off*** to ***lower*** digit) in the subjects that have been studied up to V semester.

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

iv) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	**Grade**	**Grade points Assigned**
90 & above	Superior	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative GradePoint Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \Sigma (C_i \times G_i)/\Sigma C_i$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma (C_i \times S_i)/ \Sigma C_i$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.
Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

Award of Class:

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

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

20. With–holding of Results

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

21. Multiple Entry / Exit Option

(a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6-credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

(b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

23. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section **2** and they will follow the academic regulations into which they are readmitted.

24. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 days.

25. Medium of Instruction:

The medium of instruction of the entire B. Tech undergraduate programme in Engineering &Technology (including examinations and project reports) will be in English only.

26. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

27. General Instructions:

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractices rules-nature and punishments are appended.
iii. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
v. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
vi. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

*** *** ***

ACADEMIC REGULATIONS (R23)

FOR B. TECH. (LATERAL ENTRY SCHEME)

*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2024-25** onwards)*

1. **Award of the Degree**
   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:
      (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
      (ii) Registers for 120 credits and secures all 120 credits.

   (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
      (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
      (ii) Registering for Honors is optional.
      (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years 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 requirements mentioned in item no.**2**
   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 mid semester evaluation and end examination taken together.

   ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

   And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

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 that subject at the next supplementary examination offered.

iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA
VIZIANAGARAM-535 003, A.P
(Established by Andhra Pradesh Act No.22 of 2021)
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B. Tech (Regular-Full time)

(Civil Engineering)

(Effective for the students admitted into I year from the Academic Year **2023-24** onwards)

B.TECH. - COURSE STRUCTURE – R23
(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

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VIZIANAGARAM–535003Andhra Pradesh (India)
(Established by Andhra Pradesh ActNo.22of2021)

Group-B

B.TECH- Civil Engineering

I Year I Semester						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	R23BS01	Linear Algebra & Calculus	3	0	0	3
2.	R23BS04	Engineering Chemistry	3	0	0	3
3.	R23ES07	Introduction to Programming	3	0	0	3
4.	R23ES03	Engineering Graphics	1	0	4	3
5.	R23ES04	Basic Electrical & Electronics Engineering	3	0	0	3
6.	R23BS04	Engineering Chemistry Lab	0	0	2	1
7.	R23ES07	Computer Programming Lab	0	0	3	1.5
8.	R23ES05	Electrical &Electronics Engineering Workshop	0	0	3	1.5
9.	R23MC02	NSS/NCC/Scouts &Guides/Community Service	0	0	1	0.5
		Total				**19.5**

I Year II Semester						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	R23BS02	Differential Equations and Vector Calculus	3	0	0	3
2.	R23BS03	Engineering Physics	3	0	0	3
3.	R23HS01	Communicative English	2	0	0	2
4.	R23ES01	Basic Civil & Mechanical Engineering	3	0	0	3
5.	R23PC01	Engineering Mechanics	3	0	0	3
6.	R23HS01	Communicative English Lab	0	0	2	1
7.	R23BS03	Engineering Physics Lab	0	0	2	1
8.	R23ES06	IT workshop	0	0	2	1
9.	R23ES02	Engineering Workshop	0	0	3	1.5
10.	R23PC01	Engineering Mechanics & Building Practices Lab	0	0	3	1.5
11.	R23MC01	Health and Wellness, Yoga and Sports	0	0	1	0.5
		Total				**20.5**

I Year-I Semester

L	T	P	C
3	0	0	3

LINEAR ALGEBRA & CALCULUS

(Common to All Branches of Engineering)

Course Objectives:

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications.

Course Outcomes:

At the end of the course, the student will be able to:

- develop matrix algebra techniques that is needed by engineers for practical applications.
- to find the eigen values and eigen vectors and solve the problems by using linear transformation
- learn important tools of calculus in higher dimensions.
- familiarize with functions of several variables which is useful in optimization.
- familiarize with double and triple integrals of functions of several variables in two and three dimensions.

UNIT - I: Matrices

Rank of a matrix by echelon form, normal form. Cauchy –Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method

System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT- II: Linear Transformation and Orthogonal Transformation:

Eigen values, Eigen vectors and their properties(without Proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT- III : Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT- IV : Partial differentiation and Applications (Multi variable calculus)

Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – V : Multiple Integrals (Multi variable Calculus)

Duble integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text books:

1. B.S.Grewal,HigherEngineeringMathematics,44/e,KhannaPublishers,2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e,John Wiley & Sons, 2018.

Reference Books:

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd.,2021 (9th reprint).
2. George B. Thomas, Maurice D.Weir and Joel Hass, Thomas Calculus,14/e, Pearson Publishers, 2018.
3. Glyn James, Advanced Modern Engineering Mathematics, 5/e, Pearson publishers, 2018.
4. Michael Greenberg, Advanced Engineering Mathematics, 9thedition, Pearson edn
5. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand,2021

I Year-I Semester

L	T	P	C
3	0	0	3

ENGINEERING CHEMISTRY

Course Objectives:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of ectrochemistry, polymers, surface chemistry, and cement

.

Course Outcomes: At the end of the course, the students will be able to

CO1: Demonstrate the corrosion prevention methods and factors affecting corrosion.

CO2: Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.

CO3: Explain calorific values, octane number, refining of petroleum and cracking of oils.

CO4: Explain the setting and hardening of cement.

CO5: Summarize the concepts of colloids, micelle and nanomaterials.

UNIT I Water Technology

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

UNIT II Electrochemistry and Applications

Electrodes –electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT III Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization.

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC Nylon 6,6 and Bakelite.

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.

Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement.

UNIT V Surface Chemistry and Nanomaterials

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Longmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

L	T	P	C
3	0	0	3

I Year-I Semester

INTRODUCTION TO PROGRAMMING

(Common to All branches of Engineering)

Course Objectives:

The objectives of this course is to acquire knowledge on the
i. To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
ii. To enable effective usage of Control Structures and Implement different operations on arrays.
iii. To demonstrate the use of Strings and Functions.
iv. To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
v. To understand structures and unions and illustrate the file concepts and its operations.
vi. To impart the Knowledge Searching and Sorting Techniques

UNIT-I Introduction to Computer Problem Solving:
Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem. Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

UNIT-II Introduction to C Programming:
Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements. Operators, Type Conversion. Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else—if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement**.**

UNIT-III Arrays:
Introduction, Operations on Arrays, Arrays as Function Arguments, Two Dimensional Arrays, Multidimensional Arrays. Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

UNIT-IV Functions:
Introduction Function : Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes. Recursion. Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

UNIT-V
Structures, Unions, Bit Fields:Introduction, Nested Structures, Arrays of Structures, Structures

and Functions, Self-Referential Structures, Unions, Enumerated Data Type —Enum variables, Using Typedef keyword, Bit Fields. Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

Course Outcomes:
At the end of the Course, Student should be able to:
i . Illustrate the Fundamental concepts of Computers and basics of computer programming and problem-solving approach
ii. Understand the Control Structures, branching and looping statements
iii. Use of Arrays and Pointers in solving complex problems.
iv. Develop Modular program aspects and Strings fundamentals.
v. Demonstrate the ideas of User Defined Data types, files. Solve real world problems using the concept of Structures, Unions and File operations.

Text Books:
1. A Structured Programming Approach Using C, Forouzan, Gilberg, Cengage.
2. How to solve it by Computer, R. G. Dromey, and Pearson Education.
3. Programming In C A-Practia1 Approach. Ajay Mittal, Pearson

References:
1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Computer Programming. Reema Thareja, Oxford University Press
3. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
4. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.
5. Let us C ,YaswanthKanetkar, 16th Edition,BPB Publication.
6.Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008

Web References:
1. http://www.c4learn.com/
2. http://www.geeksforgeeks.org/c/
3. http://nptel.ac.in/courses/122104019/
4. http://www.learn-c.org/
5. https://www.tutorialspoint.com/cprogramming/

I Year-I Semester

L	T	P	C
1	0	4	3

ENGINEERING GRAPHICS
(Common to All branches of Engineering)

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes:

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3: Understand and draw projection of solids in various positions in first quadrant.
CO4: Explain principles behind development of surfaces.
CO5: Prepare isometric and perspective sections of simple solids.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

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

Computer graphics: Creating 2D&3D drawings ofobjects including PCB and Transformations using Auto CAD (*Not for end examination*).

Textbook:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

I Year-I Semester

L	T	P	C
3	0	0	3

BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Common to All branches of Engineering)

Course Objectives

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes: After the completion of the course students will be able to

Course Outcomes:
CO1: Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
CO2: Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
CO3: Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
CO4: Analyze different electrical circuits, performance of machines and measuring instruments.
CO5: Evaluate different circuit configurations, Machine performance and Power systems operation.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Textbooks:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

UNIT I SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Textbooks:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

L	T	P	C
0	0	2	1

I Year-I Semester

ENGINEERING CHEMISTRY LAB

Course Objectives:

- To verify the fundamental concepts with experiments

Course Outcomes: At the end of the course, the students will be able to
CO1: Determine the cell constant and conductance of solutions.
CO2: Prepare advanced polymer materials.
CO3: Determine the physical properties like surface tension, adsorption and viscosity.
CO4: Estimate the Iron and Calcium in cement.
CO5: Calculate the hardness of water.

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter

Reference:

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

I Year-I Semester

L	T	P	C
0	0	3	1.5

COMPUTER PROGRAMMING LAB
(Common to All branches of Engineering)

Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes:
CO1: Read, understand, and trace the execution of programs written in C language.
CO2: Select the right control structure for solving the problem.
CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers.
CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

UNIT I

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment
i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

WEEK 2
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.
i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT II

WEEK 4
Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:
Lab4: Simple computational problems using the operator' precedence and associativity
i) Evaluate the following expressions.
    a. A+B*C+(D*E) + F*G
    b. A/B*C-B+A*D/3
    c. A+++B---A
    d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5
Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab 5: Problems involving if-then-else structures.
i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6
Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and

for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops
Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

UNIT III

WEEK 7:
Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:
Tutorial 7: 1 D Arrays: searching.
Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8:
Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT IV

WEEK 9:
Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array

and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 10:
Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10 : Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V

WEEK 11:
Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12:
Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13:
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:
Tutorial 13: Call by reference, dangling pointers
Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK14:
Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:
Tutorial 14: File handling
Lab 14: File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

I Year-I Semester

L	T	P	C
0	0	3	1.5

ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Course Outcomes:

CO1: Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.
CO2: Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.
CO3: Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.
CO4: Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.
CO5: Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Outcomes: At the end of the course, the student will be able to
CO1: Identify & testing of various electronic components.
CO2: Understand the usage of electronic measuring instruments.
CO3: Plot and discuss the characteristics of various electron devices.
CO4: Explain the operation of a digital circuit.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers

4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

References:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

I Year-I Semester

L	T	P	C
0	0	1	0.5

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

(Common to All branches of Engineering)

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

Course Outcomes: After completion of the course the students will be able to

CO1: Understand the importance of discipline, character and service motto.
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3: Explore human relationships by analyzing social problems.
CO4: Determine to extend their help for the fellow beings and downtrodden people.
CO5: Develop leadership skills and civic responsibilities.

UNIT I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

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I Year-II Semester

L	T	P	C
3	0	0	3

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches of Engineering)

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them in to advanced level by handling various real-world applications.

Course Outcomes:

At the end of the course, the student will be able to:

- solve the differential equations related to various engineering fields.
- model engineering problems as higher order differential equations and solve analytically.
- identify solution methods for partial differential equations that model physical processes.
- interpret the physical meaning of different operators such as gradient, curl and divergence.
- estimate the work done against a field, circulation and flux using vector calculus.

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

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits

UNIT – II : Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general particular integral, Wronskean, method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT – III : Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT - IV : Vector differentiation

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions - Divergence and Curl, vector identities

UNIT –V : Vector integration

Line integral- circulation- work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e,John Wiley & Sons, 2018.
2. B.S.Grewal,HigherEngineeringMathematics,44/e,Khanna publishers,2017.

Reference Books:

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017

L	T	P	C
3	0	0	3

I Year-II Semester

ENGINEERING PHYSICS

(Common for all branches of Engineering)

Course Objectives:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.
CO2: Familiarize with the basics of crystals and their structures.
CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.
CO6: Identify the type of semiconductor using Hall effect.

UNIT I Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT III Dielectric and Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation

polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV Quantum Mechanics and Free electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT V Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

Textbooks:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

L	T	P	C
2	0	0	2

I Year-II Semester

COMMUNICATIVE ENGLISH

(Common to All Branches of Engineering)

Course Objectives:

The main objective of introducing this course, *Communicative English,* is to facilitate using Listening, Reading, Speaking and Writing skills effectively by the students. It should result in their better comprehending abilities, oral presentations, reporting useful information and with enhanced knowledge of grammatical structures and vocabulary. This course helps the students in using speaking and writing (productive) skills more efficiently and to make them industry-ready

Course Outcomes

- **By the end of the course the students will have** Learned how to understand the context, topic, and specific information from social or transactional dialogues.
- Remedially learn applying grammatical structures to formulate sentence sand use appropriate words and correct word forms.
- Using discourse markers to speak clearly on a specific topic in formal as well as informal discussions.(not required)
- Improved communicative competence in formal and informal contexts and for social and academic purposes.
- Critically comprehending and appreciatingading /listening texts and to write summaries based on global comprehension of these texts.
- Writing coherent paragraphs essays, letters/e-mails and resume.

Instructions:

1. The reading texts can be given as podcasts to the students so that their listening skills can be enhanced
2. While listening and reading to the text can be given as homework, the classwork for the students can be to discuss and critically evaluate the texts based on the context, purpose or writing the text and understanding it from the author's as well as reader's point of view.
3. Reading as habit for both academic and non-academic (pleasure) purposes has to be inculcated in the students. So training has to be given in intensive and extensive reading strategies.
4. Writing for both academic (assignments, examinations, reports, e-mails/letters etc)
5. The writing tasks given in the class are to be self and peer evaluated by the students before they are finally graded by the faculty.

   Note: Please note that the texts given here are just contexts for teaching various language skills and sub skills. The students' ability to use language cannot be confined to comprehending or using the language related to the given texts (textbooks). The given texts can be used only for practice.
6. All the activities to develop language skills have to be integrated and interconnected, within each unit and across the units.

7. Use as many supplementary materials as possible in various modes (Audio, visual and printed versions) in the classroom so that the students get multimode input and will how to use language skills in the absence of the teacher.

UNIT I
Lesson: HUMAN VALUES: A Power of a Plate of Rice by Ifeoma Okoye (Short Story)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.(That has to be part of the bridge course- 2 weeks before the actual academic programme starts)
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNITII
Lesson: NATURE: Night of the Scorpion by Nissim Ezekiel (Indian and contemporary)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices -linkers,use of articles and zero article prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNITIII
Lesson: BIOGRAPHY Steve Jobs

Listening: Listening for global comprehension and summarizing what is listened.
Speaking: Discussing specific topics in pairs or small groups and reporting whatis discussed
Reading: Readingatextindetailbymakingbasicinferences-recognizingandinterpretingspecific contextclues;strategies touse textclues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses;subject-verbagreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV
Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing :Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active& Passive Voice
Vocabulary: Words often confused, Jargons

UNIT V
Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic on texts
Reading: Reading comprehension.
Writing: Writings structured essays on specific topics.
Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject-verb agreement)
Vocabulary: Technical Jargons

Textbooks:
1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition,Orient BlackSwan, 2023 (Units 1,2 & 3)
2. Empowering English by Cengage Publications, 2023 (Units 4 & 5)

Suggestion: Instead of giving the syllabus in the form of textbooks it would be better toprocurethe soft copies of individual texts (stories or poems or biographies and non-fiction texts)by the university and make them available on the university website for registered students to access and download

Reference Books:
1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:
GRAMMAR:
1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/

5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

L	T	P	C
3	0	0	3

I Year-II Semester

BASIC CIVIL & MECHANICAL ENGINEERING

(Common to All branches of Engineering)

Course Objectives:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

Course Outcomes: On completion of the course, the student should be able to:

CO1: Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.

CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.

CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.

CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

CO5: Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

UNIT III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and

Conveyance Structures (Simple introduction to Dams and Reservoirs).

Textbooks:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives: The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes: On completion of the course, the student should be able to

CO1: Understand the different manufacturing processes.

CO2: Explain the basics of thermal engineering and its applications.

CO3: Describe the working of different mechanical power transmission systems and power plants.

CO4: Describe the basics of robotics and its applications.

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.
Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and theirapplications.
Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineeringsystems. The evaluation shall be intended to test only the fundamentals of the subject)

Textbooks:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengagelearning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.

I Year-II Semester

L	T	P	C
3	0	0	3

ENGINEERING MECHANICS

Course Objectives:

- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a bodyto analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia anddetermine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigidbodies.

Course Outcomes: On Completion of the course, the student should be able to
CO1: Understand the fundamental concepts in mechanics and determine the frictional forcesfor bodies in contact.
CO2: Analyze different force systems such as concurrent, coplanar and spatial systems andcalculate their resultant forces and moments.
CO3: Calculate the centroids, center of gravity and moment of inertia of different geometricalshapes.
CO4: Apply the principles of work-energy and impulse-momentum to solve the problems ofrectilinear and curvilinear motion of a particle.
CO5: Solve the problems involving the translational and rotational motion of rigid bodies.

UNIT I

Introduction to Engineering Mechanics– Basic Concepts. Scope and Applications
Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant– Momentof Force and its Application –Couples and Resultant of Force Systems.
Friction: Introduction**,** limiting friction and impending motion, Coulomb'slaws of dryfriction,coefficient of friction, Cone of Static friction.

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium forSpatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.
Principle of virtual work with simple examples

UNIT III

Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures. **Centre of Gravity:** Centre of gravity of simple body (from basic principles), Centre of gravityof composite bodies, Pappus theorems.

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

UNIT IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

Textbooks:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition

I Year-II Semester

L	T	P	C
0	0	2	1

COMMUNICATIVE ENGLISH LAB

(Common to All Branches of Engineering)

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes:

CO1: Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2: Apply communication skills through various language learning activities.
CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.
CO5: Create effective Course Objectives:

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed), Kindle, 2013

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

I Year-II Semester

L	T	P	C
0	0	2	1

ENGINEERING PHYSICS LAB
(Common to All Branches of Engineering)

Course Objectives:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes: The students will be able to
CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wavelengths of different colours using diffraction grating.
CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
CO5: Calculate the band gap of a given semiconductor.
CO6: Identify the type of semiconductor using Hall effect.

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's

experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References:

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Web Resources

- www.vlab.co.in

https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

I Year-II Semester

L	T	P	C
0	0	2	1

IT WORKSHOP

(Common to all branches of Engineering)

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:

CO1: Perform Hardware troubleshooting.
CO2: Understand Hardware components and inter dependencies.
CO3: Safeguard computer systems from viruses/worms.
CO4: Document/ Presentation preparation.
CO5: Perform calculations using spreadsheets.

PC Hardware & Software Installation

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 would 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: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: 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. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

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 to the instructors by the student.

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 customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a 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 La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or 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 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

2. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
3. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
4. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
5. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
6. LaTeX Companion, Leslie Lamport, PHI/Pearson.
7. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
8. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

I Year-II Semester

L	T	P	C
0	0	3	1.5

ENGINEERING WORKSHOP
(Common to All branches of Engineering)

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice

SYLLABUS

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b) Two-way switch c) Godown lighting
   d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Textbooks:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

I Year-II Semester

L	T	P	C
0	0	3	1.5

ENGINEERING MECHANICS & BUILDING PRACTICES LAB

Course Objectives: The students completing the course are expected to

- Verify the Law of Parallelogram of Forces and Lami's theorem.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Understand the layout of a building, concepts of Non-Destructive Testing and different Alternative Materials.

Course Outcomes: On completion of the course, the student should be able to:

CO1: Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.

CO2: Verify Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever.

CO3: Determine the Centre of gravity different configurations and

CO4: Understand the Quality Testing and Assessment Procedures and principles of Non-Destructive Testing.

CO5: Exposure to safety practices in the construction industry.

Students have to perform any 10 of the following Experiments:

1. To study various types of tools used in construction.
2. Forces in Pin Jointed Trusses
3. Experimental Proof of Lami's Theorem
4. Verification of Law of Parallelogram of Forces.
5. Determination of Center of Gravity of different shaped Plane Lamina.
6. Determination of coefficient of Static and Rolling Friction.
7. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever
8. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.
9. Field-Visit to understand the Quality Testing - report.
10. Safety Practices in Construction industry
11. Demonstration of Non-Destructive Testing - using Rebound Hammer & UPV
12. Study of Plumbing in buildings.

I Year-II Semester

L	T	P	C
0	0	1	0.5

HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to All branches of Engineering)

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

Course Outcomes: After completion of the course the student will be able to

CO1: Understand the importance of yoga and sports for Physical fitness and sound health.
CO2: Demonstrate an understanding of health-related fitness components.
CO3: Compare and contrast various activities that help enhance their health.
CO4: Assess current personal fitness levels.
CO5: Develop Positive Personality

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
   Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM

VIZIANAGARAM – 535 003 Andhra Pradesh (India)

(Established by Andhra Pradesh Act No.22 of 2021)

Department Of CIVIL Engineering

COURSE STRUCTURE

(Applicable from the academic year 2023-24 onwards)

B. Tech.–II Year I Semester

S.No.	Category	Title	L	T	P	Credits
1.	BS	Numerical & Statistical Methods	3	0	0	3
2.	HSMC	Universal Human Values–Understanding Harmony & Ethical Human Conduct	2	1	0	3
3.	ES	Surveying	3	0	0	3
4.	PC	Strength of Materials	3	0	0	3
5.	PC	Fluid Mechanics	3	0	0	3
6.	PC	Surveying Lab	0	0	3	1.5
7.	PC	Strength of Materials Lab	0	0	3	1.5
8.	SEC	Building Planning and Drawing	0	1	2	2
9.	Audit Course	Environmental Science	2	0	0	-
Total			**16**	**2**	**8**	**20**

B. Tech.–II Year II Semester

S.No.	Category	Title	L	T	P	Credits
1.	Management Elective-I	Managerial Economics and Financial Analysis	2	0	0	2
2.	ES	Engineering Geology	3	0	0	3
3.	PC	Building Materials and Concrete Technology	3	0	0	3
4.	PC	Structural Analysis	3	0	0	3
5.	PC	Hydraulics &Hydraulic Machinery	3	0	0	3
6.	PC	Concrete Technology Lab	0	0	3	1.5
7.	PC	Engineering Geology lab	0	0	3	1.5
8.	SEC	Remote Sensing & GIS	0	1	2	2
9.	ES	Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation						

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

NUMERICAL & STATISTICAL METHODS (CIVIL & MECH)

Course Outcomes:

After successful completion of this course, the students should be able to:

Apply numerical methods to solve algebraic and transcendental equations
Derive interpolating polynomials using interpolation formulae.
Solve differential and integral equations numerically.
To identify real life problems into Mathematical Models.
To apply the probability theory and testing of hypothesis in the field of civil engineering Applications.

Pre-requisite: Basic algebraic Equations, Probability, random variables (discrete and continuous) and probability distributions.

UNIT- I: Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method

Interpolation: Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae.

UNIT- II: Curve fitting:

Fitting of straight line, second-degree and Exponential curve by method of least squares.
Numerical Differentiation and Integration-Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule

UNIT- III: Solution of Initial value problems to Ordinary differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge -Kutta methods (second and fourth order).

UNIT- IV: Estimation and Testing of hypothesis, large sample tests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test.

Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

UNIT- V: Small sample tests

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

Textbooks:

1. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition
3. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.India.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. R.K.Jainand S.R.K.Iyengar, Advanced Engineering Mathematics, Alpha Science International

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
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UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT

Course Objectives:

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

- Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2)
- Identify one's self, and one's surroundings (family, society nature) (L1, L2)
- Apply what they have learnt to their own self in different day-to-day settings in real life (L3)
- Relate human values with human relationship and human society. (L4)
- Justify the need for universal human values and harmonious existence (L5)
- Develop as socially and ecologically responsible engineers (L3, L6)

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

UNIT I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV

Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among

the Four Orders of Nature

Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V

Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

Lecture 23: Natural Acceptance of Human Values

Lecture 24: Definitiveness of (Ethical) Human Conduct

Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct

Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

Lecture 26: Competence in Professional Ethics

Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education

Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

Lecture 28: Strategies for Transition towards Value-based Life and Profession

Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for

UNIT I – Introduction to Value Education

PS1 Sharing about Oneself

PS2 Exploring Human Consciousness

PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body

PS5 Exploring Sources of Imagination in the self

PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust

PS8 Exploring the Feeling of Respect

PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

Readings:

Textbook and Teachers Manual

a. The Textbook

R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,* 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj – PanditSunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

SURVEYING

Course Outcomes

- At the end of the course, the learners will be able to
- Utilize the principles & methods of surveying to measure horizontal & vertical distances and angles
- Diagnose sources of errors and implement rectification methods
- Employ surveying principles to calculate areas and volumes
- Set out curves and operate modern surveying equipment
- Apply the fundamentals of photogrammetry surveying in the field

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying.

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip –systems and W.C.B and Q.B systems of locating bearings.

UNIT - II

Leveling- Types of levels, methods of levelling, and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas - Determination of areas consisting of irregular boundary and regular boundary.

Volumes -Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves.

Introduction to Tacheometric Surveying.

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station-advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LiDARSurvey(Light Detection And Ranging).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

UNIT - V

Photogrammetry Surveying:

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo-plotting instruments, mosaics, map substitutes.

Text Books:

1. Duggal S. K., Surveying (Vol. 1 & 2), Tata McGraw Hill Publishing Co. Ltd., New Delhi, 5th edition, 2019.

2. C. Venkatramaiah, Textbook of Surveying, Universities Press, 1st edition, 2011.

Reference Books:

1. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Surveying (Vol. 1), Laxmi Publications (P) Ltd., New Delhi, 18th edition, 2024.

2. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Surveying (Vol. 2), Laxmi Publications (P) Ltd., New Delhi, 17th edition, 2022.

3. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, Surveying (Vol. 3), Laxmi Publications (P) Ltd., New Delhi, 16th edition, 2023.

4. Chandra A. M., Plane Surveying and Higher Surveying, New Age International Pvt. Ltd., Publishers, New Delhi, 3rd edition, 2015.

5. N. Basak, Surveying and Levelling, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 4th edition, 2014.

6. Arora K. R., Surveying (Vol. 1, 2 & 3), Standard Book House, Delhi, 12th edition, 2015.

Web Resources:

https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse_itemnumber=23066

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

STRENGTH OF MATERIALS

Course Outcomes

At the end of the course, the learners will be able to

- Explain the basic materials' behavior under the influence of different external loading and support conditions.
- Illustrate diagrams indicating the variation of key performance features like axial forces, bending moments, and shear forces in structural members.
- Understand and calculate section modulus for determining stresses developed in beams.
- Analyze deflections due to various loading conditions.
- Evaluate stresses across sections of thin and thick cylinders and columns to determine optimum sections to withstand internal pressure using Lame's equation.

Unit I:
Simple Stresses and Strains: Elasticity and plasticity — Types of stresses and strains — Hooke's law — Factor of safety, Poisson's ratio - Relationship between Elastic constants — Bars of varying section — stresses in composite bars.
Unit II:
Shear Force and Bending Moment: Definition of beam — Types of beams — Concept of shear force and bending moment — Point of contra flexure — Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.
Unit III:
Flexural and Shear Stresses: Flexural Stresses: Theory of simple bending — Assumptions — Derivation of bending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections — Design of simple beams. Shear Stresses: Derivation of formula — Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections. Torsion – circular shafts only.
Unit IV:
Deflection of Beams: Double integration and Macaulay's methods — Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems — Moment area method — application to simple cases of cantilever.
Unit V:
Columns and Cylindrical Shells: Introduction– Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

Thin and Thick cylindrical shells — Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders. Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses

Textbooks:

1.B. S. Basavarajaiah and P. Mahadevappa, Strength of Materials, Universities Press, 3rd edition, 2010.

2.L. S. Srinath, Advanced Mechanics of Solids, McGraw Hill Education, 3rd edition, 2017.

3.R. K. Bansal, Strength of Materials, Lakshmi Publications, 16th edition, 2022.

4.J. K. Gupta and S. K. Gupta, Strength of Materials, Cengage Publications, 2nd edition, 2024.

References:

1.Beer and Johnston, Mechanics of Materials, McGraw Hill India Pvt. Ltd., 8th edition (SI Units), 2020.

2.E. P. Popov, Mechanics of Solids, Prentice Hall, 2nd edition, 2015.

3.T. D. Gunneswara Rao and Mudimby Andal, Strength of Materials - Fundamentals and Applications, Cambridge University Press, 1st edition, 2018.

4.R. K. Rajput, A Textbook of Strength of Materials (Mechanics of Solids, SI Units), S. Chand & Co., New Delhi, 7th edition, 2022.

5.S. S. Ratan, Strength of Materials, Tata McGraw Hill Publications, 3rd edition, 2016.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

FLUID MECHANICS

Course Outcomes:

At the end of the course, the learners will be able to

- Explain the principles of fluid statics, kinematics, and dynamics.
- Apply the laws of fluid statics and concepts of buoyancy.
- Describe the fundamentals of fluid kinematics and differentiate between types of fluid flows.
- Apply the principle of conservation of energy for flow measurement.
- Analyze the losses in pipes and discharge through pipe networks.

Unit I:

Basic concepts and definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility

Unit II:

Fluid statics: Fluid Pressure: Pressure at a point, Pascal ‘s law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies

Unit III:

Fluid kinematics: Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one-, two- and three-dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three -Dimensional continuity equations in Cartesian coordinates.

Unit IV:

Fluid Dynamics: Surface and body forces; Equations of motion - Euler ‘s equation; Bernoulli ‘s equation – Derivation; Energy Principle; Practical applications of Bernoulli‘s equation : Venturi meter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

Unit V:

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 – Pipes in Parallel and Series.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

Textbooks:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018.

Reference Books:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

SURVEYING LABORATORY

Course Outcomes:

- Operate various linear and angular measuring instruments. (Apply)
- Record linear and angular measurements accurately. (Apply)
- Calculate area and volume by analyzing data obtained from surveying activities. (Analyze)
- Utilize modern equipment such as a total station. (Apply)
- Compile field notes from survey data. (Create)

At the end of the course, the learners will be able to

List of Field Works:

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Plane table survey; finding the area of a given boundary by the method of radiation
4. Fly levelling: Height of the instrument method (differential leveling)
5. Fly levelling: rise and fall method.
6. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method
7. Theodolite survey: finding the distance between two in accessible points.
8. Theodolite survey: finding the height of far object.
9. Determination of area perimeter using total station.
10. Determination of distance between two inaccessible point by using total station.
11. Setting out a curve
12. Determining the levels of contours

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

STRENGTH OF MATERIALS LABORATORY

Course Outcomes

At the end of the course, the learners will be able to

- Conduct tensile strength tests and illustrate stress-strain diagrams for ductile metals. (Apply)
- Perform bending tests and determine load-deflection curves for steel/wood. (Analyze)
- Conduct torsion tests and calculate torsion parameters. (Apply)
- Perform hardness, impact, and shear strength tests, and compute hardness numbers, impact, and shear strengths. (Evaluate)
- Conduct tests on closely coiled and open coiled springs and compute deflections. (Apply)

List of experiments:

1. Tension test on mild steel / HYSD bars
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test
5. Hardness test
6. Compression test on Open coiled springs
7. Tension test on Closely coiled springs
8. Compression test on wood
9. Izod / Charpy Impact test on metals
10. Shear test on metals
11. Continuous beam – deflection test

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

BUILDING PLANNING AND DRAWING

Course Objectives:

1. Initiating the student to different building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings and public buildings.
3. Giving training exercises on various signs and bonds.
4. Giving training exercises on different building units.
5. Imparting the skills and methods of planning of various buildings.

Course Outcomes:

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

1. Plan various buildings as per the building by-laws.
2. Distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.
3. Draw signs and bonds
4. Draw different building units
5. Learn the skills of drawing building elements and plan the buildings as per requirements.

Syllabus:

1. Detailing & Drawing of Sign Conventions.
2. Detailing & Drawing of English Bond.
3. Detailing & Drawing of Flemish Bond.
4. Detailing & Drawing of Doors.
5. Detailing & Drawing of Windows.
6. Detailing & Drawing of Ventilators &Roofs.
7. Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws.
8. Drawing of Plan, Elevation & Section from line diagram for a single Storey Building.
9. Drawing of Plan, Elevation & Section for Hospital Building.
10. Drawing of Plan, Elevation & Section for Industrial Building.

Text Books:

1. Planning, designing and Scheduling, Gurcharan Singh and Jagdish Singh
2. Building planning and drawing by M. Chakraborti.
3. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

Reference Books:

1. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.
2. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, NewDelhi.
3. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi, and Chennai
4. Building Materials and Construction, G. C Saha and Joy Gopal Jana, McGrawHill Education (P)India Ltd. New Delhi.

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ENVIRONMENTAL SCIENCE

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

UNIT I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports 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 Ex-situ conservation of biodiversity.

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

UNIT III

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, 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.

UNIT V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

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

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

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(Established by Andhra Pradesh Act No.22 of 2021)

References:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice Hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes:

- Define the concepts related to Managerial Economics, financial accounting and management(L2)
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2)
- Apply the Concept of Production cost and revenues for effective Business decision (L3)
- Analyze how to invest their capital and maximize returns (L4)
- Evaluate the capital budgeting techniques. (L5)
- Develop the accounting statements and evaluate the financial performance of business entity (L5)

UNIT - I Managerial Economics

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT - II Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT - III Business Organizations and Markets

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

UNIT - IV Capital Budgeting

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT - V Financial Accounting and Analysis

Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

ENGINEERING GEOLOGY

Course Outcomes:

At the end of the course, the learners will be able to

- Explain the significance of geological agents on the Earth's surface and their importance in civil engineering. (Understand)
- Identify and understand the properties of megascopic minerals and rocks. (Understand)
- Describe the concepts of groundwater and its geophysical methods and apply knowledge to identify site parameters such as contour, slope, and aspect for topography. (Understand, Apply
- Classify earthquake-prone areas, landslides, and subsidence zones, and measure these hazards to practice hazard zonation. (Analyze)
- Investigate project sites for civil engineering projects, including site selection for mega projects like dams, reservoirs, and tunnels, using strike and dip problem-solving. (Evaluate, Analyze)

Unit I:

Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies, Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

Unit II:

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

Unit III:

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

Unit IV:

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides.

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

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

Unit V:

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

Textbooks:

1.Parbin Singh, Engineering & General Geology, Katson Educational Series, 8th edition, 2023.

2.N. Chenna Kesavulu, Engineering Geology, Laxmi Publications, 2nd edition, 2014.

References

1.Subinoy Gangopadhay, Engineering Geology, Oxford University Press, 1st edition, 2012.

2.D. Venkat Reddy, Engineering Geology, Vikas Publishing, 2nd edition, 2017.

3.Alan E. Kehew, Geology for Engineers and Environmental Society, Pearson Publications, 3rd edition, 2013.

4.K. S. Valdiya, Environmental Geology, McGraw Hill Publications, 2nd edition, 2013.

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

BUILDING MATERIALS AND CONCRETE TECHNOLOGY

Course Outcomes:

At the end of the course, the learners will be able to

- Know various engineering properties of building construction materials and suggest their suitability (Understand)
- Describe the basic ingredients of concrete and their role in its production and behavior in the field and Test the properties of fresh and hardened concrete. (Apply)
- Explain the basic concepts of concrete. (Understand)
- Design the concrete mix using the BIS method. (Apply)
- Evaluate the ingredients of concrete through lab test results and recognize the importance of concrete quality. (Evaluate)

Unit I:

Stones: Classification of Stones – Properties of stones in structural requirements. Bricks: Composition of good brick earth, Various methods of manufacturing of bricks. Tiles: Characteristics of good tile – Manufacturing methods, Types of tiles. Wood: Structure – Properties – Seasoning of timber – Classification of various types of woods used in buildings – Defects in timber. Paints: White washing and distempering, Constituents of paint – Types of paints – Painting of new and old wood – Varnish

Unit II:

Cements: Portland cement – Chemical composition – Hydration, setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume. Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Maximum aggregate size- Quality of mixing water.

Unit III:

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

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

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

Unit IV:

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

Unit V:

Mix Design and Special Concretes: Ready mixed concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self-healing concrete. Factors in the choice of mix proportions – Quality control of concrete- Statistical methods- Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method

Textbooks

1. S. K. Duggal, "Building Materials", 2nd Edition, New Age International Publishers, 2010.
2. S.C. Rangwala, "Engineering Materials", Charotar Publications, New Delhi, 2nd Edition.
3. M. S. Shetty, Concrete Technology, S. Chand & Co., 2004.
4. M. L. Gambhir, Concrete Technology, Tata McGraw Hill Publishers, New Delhi, 5th edition, 2013.
5. Job Thomas, Concrete Technology, Cengage Publications, 1st edition, 2015

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1. A. R. Santha Kumar, Concrete Technology, Oxford University Press, New Delhi
2. M. Neville, Properties of Concrete, Pearson, 4th edition, 2019
3. P. K. Mehta and Moterio, Concrete Microstructure, Properties of Materials, McGraw Hill, 4th edition, 2014
4. P.C. Varghese, "Building Materials" by Prentice-Hall of India Private Ltd, 3rd Edition, New Delhi.

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(Established by Andhra Pradesh Act No.22 of 2021)

STRUCTURAL ANALYSIS

Course Outcomes:

At the end of the course, the learners will be able to

- Apply energy theorems to evaluate trusses. (Apply)
- Analyze indeterminate structures using Castigliano's Second Theorem. (Analyze)
- Analyze the behavior of fixed and continuous beams. (Analyze)
- Evaluate continuous beams and portal frames using the slope-deflection method. (Evaluate)
- Evaluate continuous beams and portal frames using the moment-distribution method. (Evaluate)

Unit I:

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

Unit II:

Indeterminate Structures: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano 's–II theorem.

Unit III:

Fixed and Continuous Beams: Fixed beams: Analysis, SF and BM and calculations of deflections, effect of sinking and rotation of a support. Statically indeterminate (maximum of three span using three moment theorem) beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams–

Unit IV

Slope - Deflection Method: Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bay and single storeyed portal frames without sway.

Unit V

Moment Distribution Method: Introduction to moment distribution method- Application to continuous beams with and without settlement of supports-Analysis of Analysis of single bay and single storeyed portal frames without sway.

Textbooks:

1. C. S. Reddy, Basic Structural Analysis, Tata McGraw Hill Publishers, 3rd edition, 2017
2. V. N. Vazirani and M. M. Ratwani, Analysis of Structures – Vol. I & II, Khanna Publications, New Delhi

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(Established by Andhra Pradesh Act No.22 of 2021)

Reference Books:

1. C. K. Wang, Intermediate Structural Analysis, McGraw Hill, 2017
2. Aslam Kassimali, Structural Analysis, Cengage Publications, 6th edition, 2020.
3. Dr. R. Vaidyanathan and Dr. P. Perumal, Structural Analysis Vol. I and II, Laxmi Publications, 3rd edition, 2016.
4. B. D. Nautiyal, Introduction to Structural Analysis, New Age International Publishers, New Delhi.
5. D. S. Prakasa Rao, Structural Analysis, University Press.
6. B. C. Punmia, Strength of Materials and Mechanics of Structures, Khanna Publications, New Delhi

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(Established by Andhra Pradesh Act No.22 of 2021)

HYDRAULICS & HYDRAULIC MACHINERY

Course Outcomes:

At the end of the course, the learners will be able to

- Explain the characteristics of laminar and turbulent flows. (Understand)
- Apply knowledge of fluid mechanics to solve uniform flow problems in open channels. (Apply)
- Analyze non-uniform flow problems & the hydraulic jump phenomenon in open channel flows. (Analyze)
- Evaluate the impact of jets on plates and design Pelton wheel, Francis, and Kaplan turbines. (Evaluate)
- Describe the principles, losses, and efficiencies of centrifugal pumps. (Understand)

Unit I:

Laminar & Turbulent flow in pipes: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke‘s law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody‘s diagram – Introduction to boundary layer theory.

Unit II:

Uniform flow in Open Channels: Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors

Unit III:

Non-Uniform flow in Open Channels: Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

Unit IV:

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

Unit V:

Pumps: Working principles of a centrifugal pump, work done by 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

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Textbooks:

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, 22nd edition, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition, 2018.

Reference Books:

1. R. K. Bansal, A Text of Fluid Mechanics and Hydraulic Machines, Laxmi Publications (P) Ltd., New Delhi, 11th edition, 2024
2. Frank M. White, Henry Xue, Fluid Mechanics, Tata McGraw Hill, 9th edition, 2022
3. C.S. P. Ojha, R. Berndtsson, P. N. Chandramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010
4. S. K. Som, Gautam Biswas, S. Chakraborty, Introduction to Fluid Mechanics & Fluid Machines, 3rd edition, 2011

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

CONCRETE TECHNOLOGY LABORATORY

Course Outcomes:

At the end of the course, the learners will be able to

- Explain the importance of testing cement. (Understand)
- Describe the properties of cement. (Understand)
- Evaluate different properties of aggregates. (Evaluate)
- Analyze fresh concrete properties and their relevance to hardened concrete. (Analyze)
- Evaluate hardened concrete properties. (Evaluate)

List of experiments

1. **Tests on Cement**

A. Normal Consistency and Fineness of cement.

B. Initial setting time and Final setting time of cement.

C. Specific gravity and soundness of cement.

D. Compressive strength of cement.

2. **Tests on Fine and Coarse Aggregates**

A. Grading and fineness modulus of aggregate by sieve analysis.

B. Specific gravity of aggregate

C. Water absorption and bulking of sand.

3. **Tests on fresh Concrete**

A. Workability of concrete by compaction factor method

B. Workability of concrete by slump test

C. Workability of concrete by Vee-bee test.

4. **Tests on Hardened Concrete**

A. Compressive strength of cement concrete

B. Split tensile strength of concrete.

C. Modulus of rupture

D. Modulus of Elasticity and Poisson's Ratio

Non-Destructive testing on concrete Rebound hammer and UPV techniques and not limited to the above (for demonstration)

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(Established by Andhra Pradesh Act No.22 of 2021)

ENGINEERING GEOLOGY LABORATORY

Course Learning Objectives:

The objective of this course is:

- To identify the Megascopic types of Ore minerals & Rock forming minerals.
- To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection

Course Outcomes:

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

1. Identify Megascopic minerals & their properties.
2. Identify Megascopic rocks & their properties.
3. Identify the site parameters such as contour, slope & aspect for topography.
4. Know the occurrence of materials using the strike & dip problems.

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of
    a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
    b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc…
2. Megascopic description and identification of rocks.
    a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
    b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
    c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite &Biotiteschist, Marble, Khondalite, etc.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

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VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

LAB EXAMINATION PATTERN:

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

REFERENCES:

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

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY - GURAJADA - VIZIANAGARAM
VIZIANAGARAM – 535 003 Andhra Pradesh (India)
(Established by Andhra Pradesh Act No.22 of 2021)

REMOTE SENSING & GIS

Course Learning Objectives:

The course is designed to

- Introduce the basic principles of Remote Sensing and GIS techniques and its application to Civil Engineering.
- Learn various types of sensors and platforms and understand the principles of spatial analysis techniques in GIS.
- Introduce GIS software to understand the process of digitization, creation of thematic map from toposheets and maps.

Course outcomes

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

1. Acquire knowledge about concepts of remote sensing, sensors and their characteristics.
2. familiarize with data models and data structures to introduce various Raster and Vector Analysis capabilities in GIS.
3. digitize and create thematic map and extract important features to calculate geometry.
4. perform surface analysis over Contour to develop digital elevation model.
5. use GIS software to perform simple analysis in water resources and transportation engineering.

UNIT – I

Introduction to Remote sensing: History of Remote Sensing, Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interaction with Atmosphere, Energy Interaction with the Earth Surfaces - Characteristics of Remote Sensing Systems, Sensor Resolutions, Advantages & Limitations - Platforms: Types of Sensors, Airborne Remote Sensing, Spaceborne Remote Sensing - IRS, LANDSAT, SPOT & Recent satellite.

UNIT – II

Digital Image analysis: Digital Image Characteristics, Digital Image Data Formats, Band Interleaved by Pixel (BIP), Band Interleaved by Line (BIL), Band Sequential (BSQ) - Visual Interpretation Elements, Preprocessing, Enhancement, Classification, Supervised classification, Unsupervised classification.

UNIT – III

Introduction to Geographic Information System: Principles, Components and Applications of GIS - Map projections, Spatial Data Structures, Raster and Vector Data Formats, Data Inputs, Data Manipulation, Data Retrieval, Data Analysis - Spatial data analysis: Overlay Function-Vector Overlay Operations, Raster Overlay Operations, Arithmetic Operators, Comparison and Logical Operators, Conditional Expressions - Network Analysis: Components of network, Transportation network - Optimum path analysis.

Text Books:

1. Basudeb Bhatta (2021). 'Remote sensing and GIS', 3rd edn., Oxford University Press.
2. S. Kumar, (2016) 'Basics of Remote sensing & GIS', Laxmi Publications.

3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2022) 'Remote Sensing and Image Interpretation', 7thedn., Wiley India Pvt. Ltd.
4. Demers, M.N, (2013) 'Fundamentals of Geographic Information Systems', 4thedn., Wiley India Pvt. Ltd.

List of Experiments:

Expt. 1: Georeferencing a Toposheet or Map
Expt. 2: Digitization and Attribute table creation.
Expt. 3: Creation of Thematic Map
Expt. 4: Calculation of Feature geometry – Length, Area & Perimeter.
Expt. 5: Contour map – developing TIN & DEM from Contour.
Expt. 6: Stream network – Stream ordering map.
Expt. 7: Watershed - calculate Hydro-geomorphological parameters.
Expt. 8: Transportation Network Map – Route analysis.

GIS SOFTWARE: QGIS / ArcGIS

Textbook for Practical:

1. QGIS User Guide
2. ArcGIS User Manual by ESRI

References:

1. Schowengerdt, R. A (2006) 'Remote Sensing', Elsevier publishers.
2. Burrough P A and R.A. McDonnell, (1998) 'Principals of Geographical Information Systems', Oxford University Press.
3. George Joseph (2013) 'Fundamentals of Remote Sensing', Universities Press.

Web references:

1. https://nptel.ac.in/courses/10510319

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DESIGN THINKING & INNOVATION

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes:

- Define the concepts related to design thinking. (L1, L2)
- Explain the fundamentals of Design Thinking and innovation (L1, L2)
- Apply the design thinking techniques for solving problems in various sectors. (L3)
- Analyse to work in a multidisciplinary environment (L4)
- Evaluate the value of creativity (L5)
- Formulate specific problem statements of real time issues (L3, L6)

UNIT I

Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT II

Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT III

Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

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Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT IV

Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT V

Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell, Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough. H, The Era of Open Innovation – 2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/

https://nptel.ac.in/courses/109/104/109104109/

https://swayam.gov.in/nd1_noc19_mg60/preview

B.Tech. – CIVIL ENGINEERING

B.Tech. –III Year I Semester

S.No.	Category	Title	L	T	P	Credits
1	Professional Core	Water Resources Engineering	3	0	0	3
2	Professional Core	Design of Reinforced Concrete Structures	3	0	0	3
3	Professional Core	Geotechnical Engineering	3	0	0	3
5	Professional Elective-I	a) Advanced Structural Analysis b) Ground Improvement Techniques c) Watershed Development And Management	3	0	0	3
6	Open Elective-I	a) Building Services b) Green Buildings c) Construction technology and management	3	0	0	3
7	Professional Core	Geotechnical Engineering Lab	0	0	3	1.5
8	Professional Core	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5
9	Skill Enhancement course	Estimation, Specifications & Contracts	0	1	2	2
10	Engineering Science	Tinkering Lab	0	0	2	1
11	Evaluation of Community Service Internship		-	-	-	2
Total			15	1	10	23

B.Tech. III Year II Semester

	Category	Title	L	T	P	Credits
1	Professional Core	Design of Steel Structures	3	0	0	3
2	Professional Core	Transportation Engineering	3	0	0	3
3	Professional Core	Environmental Engineering	3	0	0	3
4	Professional Elective-II	a) Earthquake Resistant Design Of Structures b) Geotechnical Engineering-2 c) Transportation Safety And Environment	3	0	0	3
5	Professional Elective-III	a) Bridge Engineering b) Hydraulics and irrigation structures c) Repair and Retrofitting of structures	3	0	0	3
6	Open Elective-II	a) Disaster management b) Watershed Management	3	0	0	3
7	Professional Core	Environmental Engineering Lab	0	0	3	1.5
8	Professional Core	Transportation Engg. Lab	0	0	3	1.5
9	Skill Enhancement course	Building Information Modelling	0	1	2	2
10	Audit course	Technical paper writing & IPR	2	0	0	-
		Total	20	1	8	23
Mandatory Industry Internship of 08 weeks duration during summer vacation						

III Year-I Semester

L	T	P	C
3	0	0	3

WATER RESOURCES ENGINEERING

COURSE OBJECTIVES:

Students will have

• To Explain Engineering Hydrology And Its Applications, Types And Forms Of Precipitation,

• To Explain the Abstractions From Precipitation

• To Explain Hydrograph, Separation Of Base Flow, Unit Hydrograph, ,S-Hydrograph,IUH

• To Explain Ground Water Occurrence, Aquifer Parameters, Types Of Wells, State Of low Into Wells

• To Explain Consumptive Use, Duty And Delta, Factors Affecting Duty, Methods Of Irrigation, Water Logging

COURSE OUTCOMES:

Students will get ability to

1. understand the process of hydrologic cycle, types and forms of precipitation,
2. understand about the abstractions from rainfall
3. analyze about hydrograph, unit hydrograph, s-hydrograph,IUH
4. determine ground water Occurrence, aquifer parameters, types of wells, and the discharge into a well
5. describe consumptive use, duty and delta and methods of irrigation, water logging

UNIT – I

Introduction- hydrologic cycle, water-budget equation, world water balance, applications in engineering. Precipitation- forms of precipitation, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP).

UNIT – II

Abstractions from precipitation- evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, Interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, classification of infiltration capacities, infiltration indices.

UNIT – III

Hydrograph: hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph, S-hydrograph, IUH.

UNIT – IV

Groundwater and well hydrology- forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

UNIT – V

Water withdrawals and uses–Analysis of surface water supply, Water requirement of crops, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, estimation of evapo-transpiration, irrigation requirement. Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation. Water logging: causes, effects and remedial measures.

Text Books:

- Engineering Hydrology,KSubramanya, Edition: 5, 2020,Mc-Graw Hill.
- Ground Water 3rd Edition 2007 By H M Raghunath,New Age International

Reference Books:

- Irrigation and Water Resources & Water Power by P.N.Modi, 11th edition (15 March 2019), Standard Book House.

III Year-I Semester

L	T	P	C
3	0	0	3

DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Objectives:
The objective of the course is to

- Explain the basics concepts of Limit state design.
- Describe the design of flexure.
- Explain the basic concepts such as shear, bond.
- Explain all types of simply supported slabs in detail.
- Explain the classification of columns. Explain isolated square and rectangular footing.

Course Outcomes:
On completion of the course, the students will be able to:

1. Understand the concepts of limit state method.
2. Design of T-beam and doubly reinforced section
3. Demonstrate and design the basic concepts such as shear and bond.
4. Design different types of simply supported slabs by limit state method.
5. Design short columns by limit state method. Design different types of isolated footings by limit state method.

UNIT-I
Introduction of Limit State Design: Working Stress method (concepts) limit state design- Basic statistical principles- characteristic loads – characteristic strength – partial load and safety factors – representative stress – strain curves for cold worked deformed bars and mild steel bars. Based on IS Code: 456-2000. Comparison of Limit state method with working stress and ultimate load method. Assumptions in limit state design – stress – block parameters.
Analysis of singly reinforced beams by LSM method.

UNIT-II
Design for Flexure limiting moment of Resistance, limit state design and analysis of doubly reinforced rectangular beams and T -beam sections with examples.

UNIT – III
Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions.

UNIT – IV
Slabs: Classification of slabs, design and detailing one - way slabs, two - way slabs, and continuous one way slabs using Coefficients (conventional) of IS code- all with respect to simply supported only.

UNIT-V
Design of Compression Members: Slenderness ratio, effective length of a column, design of short - under axial loads, uniaxial and biaxial bending (Use of SP 16), Design of slender column, P-M interaction (Only for Demonstration) – I S Code provisions.
Footings: types of footings. Distribution of base pressure. General Design considerations for footings. Design of Isolated rectangular, square footing.

NOTE: All the designs to be taught in Limit State Method (IS456-2000)

Text Books:

1. Design of reinforced concrete foundations by P.C. Varghese, PHI learning private Limited, 2009.
2. Reinforced concrete design by N. Subramanian, Oxford publication, New Delhi, 2017.
3. Reinforced concrete design by S.Unnikrishna Pillai &Devdas Menon, Tata Mc.GrawHill, New Delhi, 2016.

References:

1. Reinforced Concrete Structures by Park and Pauley, John Wiley and Sons, 1975.
2. Reinforced concrete structural elements – behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill, 1994.
3. Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, NewDelhi, 2008.
4.Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi, 2006.

III Year-I Semester

L	T	P	C
3	0	0	3

GEOTECHNICAL ENGINEERING

COURSE OBJECTIVES

Students will have

- Understand the soil formation and determine the index properties of these soils and classify them
- To impart the concept of seepage of water through soils and determine the discharge of water through soils.
- To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
- Analyze the stress below the soils under different conditions.
- To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application. To study and calculate the effective stress of soils at different depths

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine the index properties of soils, classify them and establish their inter-relationships.
2. Illustrate seepage of water through soils and determine the discharge of water through soils
3. Analyze the stress below the soils under different conditions
4. Determine the magnitude and the rate of consolidation settlement
5. Calculate the effective stress of soils at different depths. Determine the shear parameters of sands and clays and the areas of their application

UNIT I:

Type of Soils, Index Properties:

Inter-relationships and Soil Characterization Types of soil and soil formation, Geological cycle, Phase diagrams, Basic terms, Functional relationships based on index properties, Physical characterization of soil-Dry and Wet sieve analysis, Atterberg's Indices, Soil Structures, Soil Water and its types, Standard nomenclature & IS Soil Classification, Numericals.

UNIT II:

Permeability and Seepage:

Darcy's law and its validity, Factors affecting permeability, Laboratory permeability tests, Permeability of stratified soil masses, Seepage pressure, 2-D flow and Laplace's equation, Flow net construction, Quick condition, Piping Failure.

UNIT III:

Effective Stress And Pore Water Pressure:

Introduction, Stresses when No Flow Takes Place Through the Saturated Soil Mass, Stresses When Flow Takes Place Through the Soil from Top to Bottom, Stresses When Flow Takes Place Through the Soil from Bottom to Top,Effective Pressure Due to Capillary ,

UNIT IV:

Compaction & Consolidation of soil:

Definitions, Differentiate between compaction and consolidation, Compaction mechanism and

proctor tests, field compactions methods, factors affecting compaction, Consolidation mechanism through spring analogy, fundamental definitions, Terzaghi's one dimensional consolidation theory (only formula), Time factor, pre-consolidation pressure, consolidation

UNIT V:

Stress Distribution:

Causes of stresses in soil, Boussinesque's and Westergard's equation, Pressure Bulb, Stress distribution on horizontal and vertical planes, Stresses due to different shapes of footings, New-mark's influence chart, Numericals.

Shear Strength of Soil:

Mohr's strength theory, Mohr- coulomb's strength theory, Modified Mohr coulomb's theory, shears parameters through lab and field tests based on drainage conditions, Numericals. Tests will be covered in lab sessions.

Text Books:

1 Basic and Applied Soil Mechanics by Gopal Ranjan&ASR Rao, New age International Pvt . Ltd, New Delhi, Third edition, 2016
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi, 2009.
3.Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, Sixteenth edition, 2017.
4. Principles of Geo technical Engineering by B. N. Das and K.Sobhan, Cengage India Private Limited; Ninth edition, 2017

References:

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
2. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork.
3. Geotechnical Engineering by Purushotham Raj
4. Fundamentals of soil mechanics by D.W.Taylor
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.

III Year-I Semester

L	T	P	C
3	0	0	3

ADVANCED STRUCTURAL ANALYSIS
(Professional Elective– I)

Course Objectives:
The objective of the course is

- To study slope deflection methods.
- To study moment distribution method.
- To learn problems on continuous beams and single bay portal frames by Kani's method.
- To study stiffness method applied to continuous beams.
- To study flexibility method applied to continuous beams portal frames. To study the plastic theory for different types of beams.

Course Outcomes:
Students will get ability to:

1. Analyze the moments of the members by slope deflection methods.
2. Analyze the moments of the members by distribution method
3. Analyze problems on continuous beams and single bay portal frames by Kani's method.
4. Analyze continuous beams by stiffness method
5. Analyze continuous beams and portal frames by flexibility method. To apply the plastic theory for different types of beams

UNIT – I

Slope deflection method: Assumptions in slope deflection method -application to the analysis of statically indeterminate beams with and without settlement of supports – rigid jointed plane frames with and without side sway.

UNIT – II

Moment Distributionmethod – Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – story portal frames – including Sway.

UNIT – III

Kani's method- Analysis of continuous beams – including without sinking and with sinking-analysis of single bay portal frames with and without sway.

UNIT – IV

Stiffness Method-Introduction- Analysis of continuous beams- portal frame non sway analysis. (Maximum of two unknowns). Simple space structures.

UNIT – V

Flexibility Method-Introduction- Analysis of continuous beams- Simple rigid frame non sway analysis. (Maximum of two unknowns).

Introduction to Plastic Analysis: Introduction-Assumption in plastic theory-plastic hinge-plastic moment or collapse moment-collapse load- load factor- shape factor- collapse load for Different types of beams i.e. simply supported beam with central point load- simply supported beam with udl,

TEXT BOOKS:

1. Structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi, 3rd edition 2010.
2. Structural Analysis (Matrix Approach) by Pundit and Gupta – Tata Mc.Graw Hill publishers, 2nd edition, 2008.
3. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi, 10th edition, 2009.
4. Comprehensive Structural Analysis-Vol.I&2 by Dr. R. Vaidyanathan& Dr. P.Perumal-Laxmi Publications pvt. Ltd., New Delhi, 3rd edition 2016.
5. Statistical indeterminate structures by C.K.Wang, 1953.
6. Analysis of Structures – Vol. I & 2 by Bhavakatti, Vikas publications, 4th edition, 2010.
7. Indeterminate Structural Analysis by K.U. Muthu, H. Narendra, MagantiJanardhana, M. Vijayanand, I K International Publishing House, 2014

REFERENCES:

1. Theory of Structures by S.P. Timoshenko and D. H. Young, Tata Mc.Graw Hill publishers 2002.
2. Analysis of structures by Vazrani&Ratwani – Khanna Publications, 1994.
3. Theory of structures by Ramamutham, Dhanpatirai publications, 2014.
4. Structural analysis by T.S ThandavaMoorthy, Oxford University Press, 2011.
5. Structural analysis by R.C.Hibbler, 6th edition 2006.
6. Basic structural analysis by Muttu&Janarthan, 3rd edition 2019.

III Year-I Semester

L	T	P	C
3	0	0	3

GROUND IMPROVEMENT TECHNIQUES
(Professional Elective– I)

COURSE OBJECTIVES:

- To explain in-situ densification techniques for granular and cohesive soils at surface level and at deeperlevel.
- To explain methods of stabilization for different types of soils.
- To illustrate different dewatering techniques to improve soil properties.
- To explain about geo synthetics and its applications and reinforced earth.
- To understand components of reinforced earth.
- To describe expansive soils and foundation considerations on expansive soils.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Explain in-situ densification methods for granular and cohesive soils at surface level and at deeper level.
2. Explain methods of stabilization and applications.
3. Illustrate different dewatering techniques to improve soil properties.
4. Explain about geo synthetics and its applications.
5. Explain components of reinforced earth.
6. Illustrate different grouting methods under different conditions in soils.

UNIT – I

Insitu densification methods

Insitu densification methods in granular Soils: Vibration at the ground surface and at depth, Impact at the Ground Surface and at depth. Insitu densification methods in Cohesive soils: Preloading, Vertical drains – Sand Drains andgeodrains – Stone columns – thermal methods.

UNIT – II

Stabilization of Soils: Methods of stabilization-mechanical-cement-lime-bituminous and polymer stabilization-chemical stabilization with calcium chloride, sodium silicate and gypsum.

UNIT – III

Dewatering: Dewatering-sumps and interceptor ditches- single and multi stage well points-vacuum well points-Horizontal wells-criteria for selection of fill material around drains-electro osmosis.

UNIT –IV

Geosynthetics: Types, functions and applications of geotextiles (woven; nonwoven; knitted) geogrids, geonet, geomembranes, gabions, geocells and geosynthetic clay liners.

UNIT - V

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

Grouting: Objectives of grouting- grouts and their applications- grouting methods- stages of grouting-hydraulic fracturing in soils and rocks- post grouttest.

TEXT BOOKS:

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Raj, P. Purushothama (2005), Ground improvement techniques., Laxmi Publications, NewDelhi

REFERENCES:

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy,USA

III Year-I Semester

L	T	P	C
3	0	0	3

WATERSHED DEVELOPMENT AND MANAGEMENT
(Professional Elective– I)

COURSE OBJECTIVES:

- To explain the concept, objectives, need &Integrated and multidisciplinary approach of watershed development, characteristics of watershed
- To explain the principles of erosion which include Types, factors affecting, Effects, estimation of soil loss of erosion etc.,
- To explain the different measures to control erosion which include contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control works, rock fill dams, brushwood dam, Gabion structures.
- to discuss the water harvesting which include Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks
- To explain the Land management which include Land use and Land capability classification, management of forest, agricultural, sustainable agriculture, dry land agriculture, Reclamation of saline and alkaline soils.To discuss the Ecosystem management which include Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, , bio-mass management, , silvi pasture, horticulture, grassland and wild land social forestry and afforestation.

COURSE OUTCOMES:

1. Understand concepts and characteristics of watershed management.
2. Discuss principles of erosion
3. Understand various measures to control erosion.
4. Describe about rain water harvesting and its structures.
5. Describe about land management.
6. Describe about ecosystem management.

UNIT-I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

Characteristics of watershed: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II

Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation, revised universal soil loss equation.

UNIT-III

Measures to control erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control works, rock fill dams, brushwood dam and Gabion structures.

UNIT-IV

Water harvesting: Rainwater harvesting and harvesting structures, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds,

percolation tanks.\

UNIT-V

Land management: Land use and Land capability classification, management of forest land, management of agricultural land, sustainable agriculture, dry land agriculture, Reclamation of saline and alkaline soils.

Ecosystem management: Role of Ecosystem, soil enrichment, cropping pattern, management of grassland and wild land, social forestry andafforestation.

TEXT BOOKS:

1. JVS Murthy (2017), Watershed Management, 2nd edition, New Age InternationalPublishers.
2. R. Awurbs and WP James (2015), Water Resource Engineering, 1st edition, Prentice HallPublishers.

REFERENCE:

1. VVN Murthy (2013), Land and Water Management, 6th edition KalyaniPublications.
2. D.K.Majumdar (2014), Irrigation and Water Management, 2nd revised edition, PrinticeHallIndia.

III Year-I Semester

L	T	P	C
3	0	0	3

BUILDING SERVICES
(Professional Elective– I)

Objectivesofthe Course:

- Building services are the essential services provided in the buildings for improving functioning of the buildings in efficient manner for the desired use of the building.
- The electrical services, mechanical services such as air conditioning, lighting, ventilation, fire protection, acoustics and sound insulations, elevators, escalators, as well as civil engineering services such as water supply, sanitary services, etc. have become most essential services for residential, industrial, high rise, hotels, motels, monumental buildings.
- Themain objectiveof thecourseis to teachstudents about theseservices.
- Nobuildingcanbeputinto effectiveutilisation withoutall these services.
- To develop skills in the students to prepare plan for various types of services in the building.

UNIT-I

IntroductiontoBuildingServices:

Definitions, Objective and uses of services, Applications of services for differenttypes building considering, Classification of building services, Types of services and selection of services, Natural and artificial lighting- principles and factors, Necessity of Ventilation, Types of ventilation – Natural and Mechanical, Factors to be considered in the design of Ventilation.

UNIT-II

ElectricalServicesandLayoutinDifferentTypesof Building:

Technical terms and symbols for electrical installations and accessories of wiring, Types of insulation, electrical layout for residence, small work shop, show room, school building, etc.

UNIT-III

MechanicalServicesinBuildings:

Introductionofmechanicalservices

Lift: Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts

Elevators &Escalators:Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators, Uses of different types of elevatorsEscalators.

Air Conditioning:Definition, Purpose, Principles, Temperature Control, Air Velocity

Control, Humidity Control, Air Distribution system, Cleaners, Filters, Spray washers, Electric preceptors, Types of Air Conditioners, (Central type, Window Type, Split Unit

UNIT-IV

Introduction, Causes of fire and Effects of fire,General Requirements of Fire Resisting Building as per IS: 1642:1989 and NBC 2005, Characteristics of Fire Resisting Materials , Maximum Travel Distance, Fire Fighting Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs

UNIT-V

Miscellaneous Services and Green Buildings Provisions:

Plan for Rain Water Harvesting in the New Buildings, Concept of GREEN Buildings, Components of GREEN Building, Components of Grey Water System, Management of Grey Water System and Distribution Pattern, Solar Power System

Textbook Reference Books:

1. R.Udaykumar; A textbook on Building Services; EswarPress,Chennai
2. S.M.Patil; Building Services; Seem a Publication,Mumbai Revised edition
3. Bureau of Indian Standards; National Building Codeo fIndia–2005;BIS,NewDelhi
4. Dr.B.C.Punmia;Building Construction; Laxmi Publications(P)Ltd.,New Delhi
5. P.C.Varghese; Building Construction;PHILearning(P) Ltd.,New Delhi
6. P.S.Gahlot; Building repair and Maintenance Management;CBSPublishers& Distribution(P) Ltd

Indian Codes of Practice:

1. IS:1642:1989, Code of Practice for Fire Safety of Building
2. NBC2016,National Building Code of India

III Year-I Semester

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GREEN BUILDINGS
(Open Elective– I)

Course objectives: This course will enable students to:

- UnderstandtheDefinition,Concept&Objectivesofthetermscosteffectiveconstruction and green building
- Apply cost effective techniques in construction
- 3.ApplycosteffectiveTechnologiesandMethodsinConstruction
- Understand the Problems due to Global Warming
- State the Concept of Green Building Understand Green Buildings

Course outcome

- Select different building materials for construction
- Apply effective environmental friendly building technology
- Analyze global warming due to different materials in construction
- Analyse buildings for green rating
- Use alternate source of energy and effective use water

UNIT-I

Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- LimePoszolana Cement- Gypsum Board- Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite-Bamboo- Availability of different materials- Recyclingofbuildingmaterials–Brick-Concrete-Steel-Plastics-Environmentalissuesrelatedto quarryingofbuildingmaterials.

UNIT-II

Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof - Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies - Costford - Nirmithi Kendra - Habitat

UNIT-III

Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical

benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in MaterialsGreen Materials-ComparisonofInitialcostofGreenV/sConventionalBuilding-Lifecyclecostof Buildings.

UNIT-IV

Green Building rating Systems- BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in BuildingDesign-CharacteristicsofSustainableBuildings– SustainablymanagedMaterials-IntegratedLifecycledesignofMaterialsandStructures(Conceptsonly)

UNIT-V

Utility of Solar Energy in Buildings

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

Green Composites for Buildings

Concepts of Green Composites, Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

Text Books

1. HarharaIyer G,Green Building Fundamentals,NotionPress
2. Dr.Adv.HarshulSavla, Green Building: Principles & Practices

III Year-I Semester

L	T	P	C
3	0	0	3

CONSTRUCTION TECHNOLOGY AND MANAGEMENT
(Open Elective– I)

COURSE OBJECTIVES:

1. To explain the basics of scientific management and project planning, clearance and procedures
2. To explain project scheduling CPM PERT
3. To explain project monitoring and controlling and reporting techniques
4. To explain work study and work measurement
5. To explain safety engineering, safety policies and practices
6. To explain administration of incentive schemes

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. illustrate the basics of scientific management and project planning, clearance and procedures
2. demonstrate project scheduling CPM PERT
3. illustrate project monitoring and controlling and reporting techniques
4. appreciate work study and work measurement
5. sensitize safety engineering, safety policies and practices
6. illustrate administration of incentive schemes

Unit–1

Basics of Management: Modern scientific management, Management Functions, Management Styles, SWOT Analysis in construction

Project Management: Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic environmental impact analysis, project clearance procedures and necessary documentation for major works like dams, multistoried structures, ports, tunnels, Qualities, role and responsibilities of project manager, Role of Project Management Consultants, Enterprise Resource Planning (ERP)

Unit 2

Project Scheduling: Construction Scheduling, Work break down structure, activity cost and time estimation in CPM, PERT,RPM (Repetitive Project Modeling) techniques. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).

Unit 3

Project Controlling: Monitoring and Control, Crashing, Resource Leveling, Updating. Site mobilization – demobilization aspects, various Resources management based on funds availability, coordinating, communicating & reporting Techniques, Application of MIS to construction, Training forConstruction Managers ,Engineers , Supervisors

Unit -4

Work Study: Definition, Objectives, basic procedure, method study and work measurement, Work study applications in Civil Engineering.
Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams.
Work measurement – Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time-lapse , photography technique, Analytical production studies

Unit -5
Safety Engineering: Causes of Accidents on various sites, safety measures and safety policies to be adopted, determination of safety parameters, personal protective equipment. Workmen Compensation Act, Minimum wages act.
Safety Organization –Safety Policy, Safety Record Keeping, Safety Culture, Safety and First Line Supervisors, Middle Managers, Top Management Practices, Sub contractual obligation, Project Coordination and Safety Procedure

Administration of Incentive Schemes: Necessity, Merit rating, job evaluation, installation, modification and maintaining of incentive schemes based on implementation experience.

Text Books
1. Construction Project planning & Scheduling By Charles Patrick, Pearson, 2012
2.Chitkara,K.K., Construction Project Management, Tata McGraw Hill Publishing Co, Ltd., New Delhi, 1998.
3.Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, new delhi,1987.
Reference books
1. Construction Planning & management By P S Gahlot& B M Dhir , New Age InternationalLimited Publishers
2. Construction Project planning & Scheduling By Charles Patrick, Pearson, 2012
3. Construction Project Management Theory & practice --- Kumar Neeraj Jha,Pearson,2012
4. Construction management Fundamantals by Knutson,Schexnayder, Fiori, Mayo, TataMcGraw Hill, 2ndEdition, 201

III Year-I Semester

L	T	P	C
0	0	3	1.5

GEOTECHNICAL ENGINEERING LAB

COURSE OBJECTIVES:

Students will have

- To know how to find Atterberg's Limits, Field Density, Relative density of sand.
- To know how to do Grain size analysis, compaction test, CBR Test.
- To know how to do Unconfined Compression test, Triaxial Compression test.
- To know how to do Direct Shear test, Vane Shear test etc.,
- To know how to ddetermine Consolidation of soil.

COURSE OUTCOMES:

Get ability to

1. Evaluate Atterberg's limits and Differential free swell for clayey soils.
2. Examine relative density, dry density & moisture contents in the field and laboratory by core cutter, sand replacement and compaction tests.
3. Determine permeability of soils
4. Analyze coarse and fine grain sizes in laboratory.
5. Determine shear strength and shear strength parameters by vane shear, tri-axial, direct shear & unconfined compression tests in laboratory.
6. Measure CBR value and consolidation settlement & swell pressure in laboratory.

LIST OF EXPERIMENTS

1. Atterberg's Limits.
2. Field Density-Core cutter and Sand replacement methods
3. Relative Density of Sand
4. Grain size analysis - Sieve Analysis and Hydrometer analysis
5. Permeability of soil - Constant and Variable head tests
6. Compaction test
7. Consolidation Test
8. CBR test
9. Unconfined Compression test
10. Direct Shear test.
11. Vane Shear test.
12. Differential free swell (DFS)

III Year-I Semester

L	T	P	C
0	0	3	1.5

FLUID MECHANICS & HYDRAULIC MACHINES LAB

COURSE OBJECTIVES:

Students will have

• to study how to calibrate of venturimeter& orifice meter.

• to study how to determine of coefficient of discharge for a small orifice and external mouth piece by a constant head method.

• to study how to calibrate of Trapezoidal Notch and /or Triangular Notch.

• to study how to determine Coefficient of loss of head in a sudden contraction and friction factor and impact of jet on vanes.

• To study how to determine efficiency of Pelton wheel turbine, centrifugal pump and reciprocating pump.

COURSE OUTCOMES:

After completion of this course students will be able to

1. Evaluate Coefficient of discharge of Venturimeter and Orifice meter.
2. Examine Coefficient of discharge for a small orifice and external mouth piece by a constant head method.
3. Compute Coefficient of discharge of Trapezoidal Notch and /or Triangular Notch.
4. Determine loss of head in a sudden contraction and friction factor and force exerted by jet onvanes.
5. Measure efficiency of Pelton wheel turbine
6. Calculate efficiency of centrifugal pump and reciprocating pump.

LIST OF EXPERIMENTS

1. Calibration of Venturimeter
2. Calibration of Orifice meter.
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 constant head method.
5. Calibration of contracted Trapezoidal Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Impact of jet on vanes.
8. Performance test on Pelton wheel turbine
9. Efficiency test on centrifugal pump.
10. Efficiency test on reciprocating pump.

III Year-I Semester

L	T	P	C
0	1	2	2

ESTIMATION, SPECIFICATIONS & CONTRACTS

COURSE OBJECTIVES:

1. To identify standard specifications for detailed estimation of building.
2. To estimate earthwork excavation for roads and canals.
3. To determine the rates of various aspects of buildings.
4. To compute the cost of the various items of civil works.
5. To recognize preparation of the tenders and Valuation of buildings.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Prepare detailed and abstract estimate of buildings.
2. Compute earthwork excavation for roads and canals.
3. Estimate the cost of the various items of civil works.
4. Estimate reinforcement for bar bending and prepare bar bending schedules.
5. Understand the basics of BIM
6. Prepare tenders and Valuation of buildings.

UNIT – I

General items of work in Building: Standard Units, Principles of working out quantities for detailed and abstract estimates - Detailed Estimates of Buildings.

UNIT – II

Earthwork for roads and canals: Lead and Lift – Types of methods – Mid Sectional area method – Mean sectional area method – Simpson's rule method

UNIT – III

Rate Analysis: Standard specifications for different items of building construction. Working out data for Brick Masonry, R.R. Masonry, Plastering, Plain Concrete, R.C.C., and Distempering.

UNIT-IV

Reinforcement bar bending schedule: Footing, Pedestal, column, plinth beam, slab beam and slab and bar requirement schedules.

UNIT – V

Contracts – types of contracts- tenders – Tender Schedule–.BIM-Basics of BIM – Advantages and Dis advantages of BIM – Objects of BIM

Valuation - Valuation of buildings – Depreciation –Types of Depreciation of industrial building, commercial Buildings-Private Buildings.

TEXT BOOKS

1. B.N. Dutta (2016), Estimating and Costing, 28th Revised Edition, UBS publishers
2. G.S. Birdie (2014) Estimating and Costing, Sixth edition, Dhanpat Rai Publishing Company Private

Limited
3. Bimal Kumar (2016), A Practical Guide to Adopting BIM in Construction Projects, Whittles Publishing

REFERENCES:

1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works.
3. M. Chakraborthi (2010), Estimation, Costing and Specifications, 24th Edition, M.K. Publishers
4. National Building Code, 2016

REFERENCE CODE BOOKS:

1. ISO 19650-1:2018
2. ISO 19650-2:2

III Year-I Semester

L	T	P	C
0	0	2	1

TINKERING LAB

Course Objectives:

- To develop a mindset for innovation, creativity, and problem-solving through hands-on activities.
- To introduce students to basic tools, components, and systems used in prototyping (electronics, mechanical, software).
- To encourage interdisciplinary thinking and collaborative project development.
- To provide exposure to modern tools such as Arduino, Raspberry Pi, sensors, 3D printing, and simple mechanical assemblies.
- To build confidence in experimenting with ideas and transforming them into working prototypes.

List of Experiments

1. Familiarization with lab tools – Breadboard, multimeter, soldering station, power supply.
2. Basic electronic circuits – Series, parallel circuits, use of resistors, capacitors, LEDs.
3. Introduction to Arduino – Writing and uploading simple sketches.
4. Sensor interfacing – Temperature, light, motion, ultrasonic sensors.
5. Actuator control – Servo motor, DC motor, relay modules.
6. Serial communication – Between Arduino and PC.
7. Simple IOT application – Sending data to cloud (e.g., using ThingSpeak or Blynk).
8. Mobile App Integration – Basic app to control devices using Bluetooth.
9. Mechanical prototyping – Introduction to 3D printing and simple CAD modeling.

Textbooks

1. "Getting Started with Arduino" – Massimo Banzi and Michael Shiloh.
2. "Make: Electronics – Learning Through Discovery" – Charles Platt.
3. "Exploring Arduino" – Jeremy Blum.

Reference Books:

1. "Practical Electronics for Inventors" – Paul Scherz and Simon Monk.
1. "Arduino Cookbook" – Michael Margolis and Brian Jepson.
2. "Make: Sensors" – Tero Karvinen, Kimmo Karvinen, and Ville Valtokari.
3. "Python Programming for Raspberry Pi" – Tim Cox (if Raspberry Pi is included).

E resources: Arduino (www.arduino.cc), Raspberry Pi (www.raspberrypi.org), Instructables (www.instructables.com), and Tinkercad.

Course Outcomes

At the end of the course, students will be able to:

- Identify and use basic electronic components and prototyping tools.
- Design and implement simple circuits and embedded systems using microcontrollers.
- Use sensors and actuators to create interactive systems.
- Apply mechanical fabrication techniques using 3D printers and simple mechanical tools.
- Collaborate effectively to build innovative, interdisciplinary prototypes or mini-projects.

- Present and communicate their design ideas and implementation clearly.

III Year-II Semester

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DESIGN OF STEEL STRUCTURES

COURSE OBJECTIVES:

The objective of the course is to

- Understand the basics concepts of bolted connections and designs welded connections
- Design supported, unsupported and plated simply supported beams
- Explain designing tension members as per IS codes
- Explaindesigning of compression members as per IS code provisions
- Explain designing of welded plate girder

COURSE OUTCOMES:

Students will get ability to

1. Design IS code bolted connections and designs welded connections.
2. Design beams including detailing.
3. Design tension members including detailing.
4. Design compression members including detailing.
5. Design plate girder including detailing.

UNIT– I

Basics of bolted/riveted connections: Bolted/riveted connections, Types of bolts, Types of bolted joints, Failure of bolted joints, Specifications of bolted joints, Design of bolted connections.

Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds. IS Code requirements? Design strength of fillet welds subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT – II

Beams: Allowable stresses, design requirements as per IS Code-design of laterally supported and unsupported beams. Design of plated beams.

UNIT –III

Tension members: Introduction, Types of tension members, Net sectional Area, Effective net area, Types of failures, Design of tension members.

UNIT – IV

Design of Compression members: Introduction, Effective length of columns, Slenderness ratio, Design of compression members, Built-up sections- Design of lacings and battens. Design Principles of Eccentrically loaded columns and splicing of columns.

UNIT – V

Plate Girder: Introduction, Elements of plate girder, Design consideration – I S Code recommendations, Design of plate welded plate girder- post-critical method, stiffeners.

NOTE- All Designs should be in LIMIT STATE Method

Text Books:

1. Limit state design of steel structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi, 2nd edition, 2017.
2. Design of Steel Structures by Ramachandra. Vol – 1, Scientific Publishers, 2016.
3. Design of Steel structures by Limit state method as per IS-800:2007, S.S.Bhavakatti, I K International Publishing House Pvt. Ltd, 4th edition, 2014.
4. Steel Structures and Design and practices by N.Subramanya, Oxford publications, 2010.
5. Structural Design and Drawing by N.Krishna Raju; University Press, 2009.

Reference Books:

1. Comprehensive Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi, 2nd edition, 2015.
2. Structural design in steel by SarwarAlamRaz, New Age International Publishers, New Delhi, 2018.
3. Design of Steel Structures by Arya and Azmani, Nem Chand Publisher, 2011.

IS Codes:

1) IS-800 – 2007, 2) IS – 875 – Part I, II & III, and 3) Steel Tables.

III Year-II Semester

L	T	P	C
3	0	0	3

TRANSPORTATION ENGINEERING

COURSEOBJECTIVES:

The objective of the course is to

- Explain about highway development and planning in India, highway alignment and engineering surveys.
- Explain about various elements of highway geometric design.
- Explain about highway materials such as soil, aggregates, bitumen and bituminous mix design.
- Explain about construction of different types of roads and highway maintenance.
- Explain about basic traffic engineering characteristics such as volume, speed, density, accidents and about Intersections. Explain about Highway Capacity.

COURSEOUTCOMES:

On completion of the course, the students able to:

1. Understand the importance of highway development and different road classifications.
2. Evaluate the Geometric design elements of the highway.
3. Identify and gain knowledge about highway materials used in highway construction.
4. Understanding the mechanism of different types of roads and their construction.
5. Apply basic parameters of traffic, parking studies, road accident analysis and identifying grade and grade separated intersections. Analyse about Highway Capacity.

UNITI

Highway development and planning: Invention of wheel - Different modes of transportation, role of highway transportation in India, Necessity for Highway Planning - Different Road Development Plans - Classification of Roads, Road Network Patterns.

Highway Alignment: Alignment - Factors controlling Alignment, Engineering Surveys for Highways - Drawings and Reports.

UNITII

Geometric design: Importance of Geometric Design, Highway Cross Section Elements – Pavement Surface Characteristics, Sight Distance - Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance.

Design of Horizontal Alignment - Design of Super elevation and Extra widening, Design of Transition Curves, Design of Vertical Alignment, Grade Compensation.

UNITIII

Highway materials: Soil, Aggregate, Bitumen and Tar, Tests on aggregates −Aggregate Properties and their Importance, Tar properties - Differentiation between Tar and Bitumen, Bitumen - different forms of bitumen - tests on bitumen - Bituminous Concrete, requirements of Design Mix - Marshalls Method of Bituminous Mix design, Modified Hubbard Field method of mix design.

UNITIV

Highway Construction: Construction of Roads -Earthen roads, W.B.M. Roads, Bituminous Roads - distresses; Cement Concrete roads -Tie bars and Dowel bars, distresses. Highway Maintenance, Highway drainage −Arborical culture −Street lighting.

UNITV

Traffic engineering: Elements of Traffic Engineering - Vehicle & Road User Characteristics, Accessibility & Mobility concept, Traffic Volume studies & methods, Speed Studies – Time Mean Speed, Space Mean Speed, Travel time and Delay studies, Origin - Destination studies,

Highway capacity: Highway capacity and level of service (LOS) - capacity of urban and rural roads, PCU

concept and its limitations.

TEXTBOOKS:

1.S.K.Khanna, C.E.G.Justo& A. Veeraragavan “Highway Engineering”, Nemchand& Bros., 10th Edition, 2017.
2. Dr. L.R.Kadiyali and Lal “ Traffic Engineering & Transport Planning” Khanna Publications, 7th Edition, 2012.
3. V.N.Vazirani and S.P.Chandra, “Transportation Engineering- Vol. I”, Khanna Publications, 4th Edition, 1994.

REFERENCES:

1. S.P.Bindra, “Highway Engineering” Dhanpat Rai & Sons. – 4th Edition (1981)
2. ITE Hand Book, Highway Engineering Hand Book, Mc Graw - Hill
3. Indian Road Congress, Ministry of Road Transport and Highways, and Special Publications

III Year-II Semester

L	T	P	C
3	0	0	3

ENVIRONMENTAL ENGINEERING

Course Objectives:

This course enables the students:

1. To describe the importance of water quality and quantity and interpret the design of water supply systems.
2. To apply the appropriate technologies for water treatment.
3. To interpret the concepts of water supply systems designing and management.
4. To explain the impacts of sewage and select conveyance systems for sewage and storm water.
5. To identify and apply suitable process for the sewage treatment and sludge management.

Course Outcomes:

After completion of this course, students will be able to:

1. Examine and explain various sources of water, water quality and quantity estimation.
2. Analyze the appropriate water treatment technology.
3. Interpret the concepts of water supply systems designing and management.
4. Understand and determine the fundamentals of wastewater generation, conveyance system, wastewater quality and different discharge standards.
5. Explain and illustrate various methods of wastewater and sewage sludge treatment.

Unit-I:

Introduction: Sources of Water - Comparison from quality and quantity – intakes, infiltration galleries. Waterborne diseases - protected water supply - population forecasting methods, design period - types of water demand - factors affecting – fluctuations - fire demand - storage capacity, drinking water quality standards: IS 10500.

Unit-II:

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

Unit-III:

Water Supply Systems: Requirements - methods and layouts - Design of distribution systems - Hardy Cross and equivalent pipe methods - Service reservoirs - Capacity by Mass Curve Method. Joints, sluice valves, air valves. Scour valves and check valves, water meters.

Unit-IV:

Conservancy and Water Carriage Systems: Sewage and storm water estimation - characteristics of sewage – decomposition of sewage, examination of sewage – B.O.D. Equation. C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses.

Unit-V:

Layout and General Outline of Waste Water Treatment Plants and Disposal of Sewage: Waste water treatment plant – Flow diagram – primary treatment - design of screens – grit chambers – skimming tanks – sedimentation tanks – biological treatment – trickling filters – Activated sludge processes (ASP). Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying - septic tanks working principles and design – soak pits.

Text Books:

1. Water Supply Engineering: Environmental Engineering - Vol. I, by S.K. Garg, Khanna Publishers, New Delhi
2. Sewage Disposal and Air Pollution Engineering: Environmental Engineering - Vol. II, S.K. Garg, Khanna Publishers, New Delhi
3. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers, 1996
4. Water supply and sanitary Engineering by G.S. Birdi, Birdie J. S Dhanpat Rai & Sons Publishers, 2010.
5. Water Supply Engineering, Vol. 1, B.C.Punmia, Ashok Kr. Jain, Arun Kumar Jain, Laxmi Publications Pvt.Ltd New Delhi, 2 edition, 1994
6. Environmental Engineering, Peavy, H., Rowe, D.R, Tchobanoglous, G. Mc-Graw - Hill International

Reference Books:

1. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.
2. Encyclopedia of Environmental Science and Engineering, McGraw-Hill, Inc.3rd edition-1993.
3. Water Supply Engineering: S. K. Garg, Khanna Publishers, New Delhi.
4. Water supply: Don D. Ratnayaka Malcolm, J. Brandt, Michael Johnson, 6th edition, 2009
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi
6. Metcalfe and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
7. Water and Wastewater Engineering – designs, principle and practice, Mackenzie L. Davis. McGraw-Hill Education

III Year-II Semester

L	T	P	C
3	0	0	3

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
(Professional Elective– II)

Course Outcomes:

At the end of the course, the student will be able to:

- Discuss the equations of motion for undamped free vibrations for SDOF and 2DOF systems
- Explaintheengineeringseismologyincludingcausesandeffectsofearthquakes
- Analyse a multi-storeyed structure using Equivalent Static Method and Response Spectrum methods
- Assess various irregularities in buildings
- ApplytheprovisionsofIS:13920andIS:4326tobuildingstructures

UNIT-I

STRUCTURALDYNAMICS:

Introduction–Physical and Mathematical Modelling–Discrete and continuum Modelling. Laws of Equilibrium–Newton's Law of Motion–D'Alembert's Principle and Principle of virtual displacement.- Types of Dynamic Loading.

Single Degree of Freedom System (SDOF)–Undamped Free Vibrations–Damped Free Vibrations (concept only).

Two Degree of Freedom System (2DOF)–Undamped Free Vibrations–Determination of Natural frequencies and Mode shapes.

UNIT-II

ENGINEERINGSEISMOLOGY:

Introduction- Internal structure of earth – Chemical properties – Physical properties – Continentaldrifttheory–Platetectonics–MovementofplateBoundaries–Movementof Indian plate – Faults – Types of faults – Elastic Rebound theory.

Earthquakes – Earthquake terminology – Classification of Earthquakes – Causes and effects of Earthquakes –Earthquake waves – Quantification of Earthquakes – Intensity and Magnitude – Recording Earthquakes.

UNIT-III

EARTHQUAKERESISTANTDESIGN:

Reviews of latest I.S : 1893 (Part 1) provisions for buildings - General principles and design criteria – Assumptions – Design Acceleration spectrum – Horizontal seismic coefficient –Design acceleration – Seismic zones of India – Importance factor – Response reduction factor – Design lateral force – Design imposed loads for Earthquake force calculation –Seismic weight – Analysis by Equivalent Static Method and Dynamic Method (Response Spectrum Method) – Storey drift limitation.

UNIT-IV

BUILDINGCONFIGURATIONS:

Introduction–Regular and Irregular Buildings.

Plan Irregularities–Torsion Irregularity–Re-entrant corners-Floor slabs having excessive cut-outs or openings- Out of plane offsets in Vertical Elements – Non-parallel Lateral Force system.

Vertical Irregularities – Stiffness Irregularity (soft storey) – Mass Irregularity – Vertical Geometric Irregularity – In-plane discontinuity in Vertical Elements resisting lateral force – strength Irregularity(weak storey) –Floating or stub columns–Irregular Modes of Oscillation in two Principle Plan Directions.

UNIT-V

DUCTILEDESIGNANDDETAILING:

Review of Latest IS:13920 provisions
General specifications – Beams – Columns – Shear walls. Special confining reinforcement.
Review of Latest IS:4326 provisions- General principles–Special Construction features relating to separations of structures (above ground only).

TEXTBOOKS:

1. A.K. Jain "Dynamics of Structures with Mat Lab Applications" Pearson India Education Series Pvt.Ltd., Delhi, 2016
2. Pankaj Agarwal & Manish Shrikhande, "Earthquake Resistant Design of Structures", 5th Edition Prentice Hall of India, New Delhi, 2011.
3. S.K.Duggal, "Earthquake Resistant Design of Structures", Oxford University Press, 1st Edition, 2012.

REFERENCES:

1. Chopra A.K., "Dynamics of Structures", 5thEdition, Pearson Education, Indian Branch, Delhi, 2007.
2. Mario Paz, "Structural Dynamics - Theory and Computations", 6thEdition, Pearson Education, 2005.
3. IS 456: 2000 Indian Standard Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standard,New Delhi. (or latest).
4, IS 1893 (Part 1): 2016, Indian Standard "Criteria for Earthquake Resistant Design of Structures, Part 1, General provisions and Buildings (six revision) Bureau of Indian Standard, New Delhi. (or latest).
5. IS 13920: 2016 Indian Standard "Ductile Design and Detailing of Reinforced Concrete Structures, subjected to Seismic forces - Code of Practice, Bureau of Indian Standard, New Delhi. (or latest).
6. IS 4326: 2013 Indian Standard "Earthquake Resistant Design and Construction of Buildings - Code of Practice, Bureau of Indian Standard, New Delhi. (or latest).

III Year-II Semester

L	T	P	C
3	0	0	3

GEOTECHNICAL ENGINEERING-2
(Professional Elective– II)

Course Objective:

- Toprovideacoherentdevelopmenttothestudentsforthecoursesinsectorof Geotechnical Engineering& Soil Improvement Techniques etc.
- TopresentthefoundationsofmanybasicEngineeringtoolsandconceptsrelated Geotechnical Engineering.
- To give an experience in the implementation of Engineering concepts which are applied in field of Geotechnical Engineering
- Toinvolvetheapplicationofscientificandtechnicalprinciplesofplanning,analysis, design of foundation along with soil improvement techniques.

UNIT-I

Stability of slopes:

Infinite and finite slopes, factor of safety, type of slope failure, stability of infinite slopes, finite slopes forms of slip surfaces, limit equilibrium method and critical stage instability analysis, effects of tension crack and submergence, C-analysis-method of slices, taylor's stability no., use of Bishop's method.

UNIT-II

Earth Pressure:

Types of lateral earth pressure, Rankine's and Coulomb's earth pressure, theory andtheir application for determination of lateral earth pressure under different conditions, Rebhann's and culminnn's Graphical methods of determination of lateral earth pressures.

Basics of foundation:

Types of foundation, Factors affecting the selection of type of foundations, steps in choosing types of foundation.

UNIT-III

Subsurface Investigation:

Objectives of exploration, planning of exploration program, soil samples and soil samplers, field penetration tests : SPT, SCPT, DCPT. Introduction to geophysical methods, Bore log and report writing.

UNIT-IV

Bearing Capacity of Shallow Foundation:

Introduction, significant depth, design criteria, modes of shear failures. Detail study of bearing capacity theories (Prandtl, Rankine, Terzaghi, Skempton), bearing capacity determination using IS Code, Presumptive bearing capacity. Settlement, components of settlement & its estimation, permissible settlement, allowable bearing pressure. Bearing capacity by use of penetration test data and by plate load test. Bearing capacity of raft. Factors affecting bearing capacity including Water-Table. Contact pressure under rigid and flexible footings. Floating foundation. Types of pavements & its design.

UNIT-V

Pile Foundations :

Introduction, load transfer mechanism, types of piles according to their composition, their method of installation and their load carrying characteristics, piles subjected to vertical loads- pile load carrying capacity from static formula, dynamic formulae (ENR and Hiley), penetration test data & Pile load test. Pile group: carrying capacity, efficiency and settlement. Negative skin friction. Under reamed pile foundation-its concept, design& field installation.

Text Books:

1. P.PurushothamaRaj;SoilMechanicsandFoundationEngineering;PearsonEducation.

2.Alamsingh; Soil Mechanics &Foundation Engineering;CBS Publishers & Distributors,Delhi

3. TaylorD.W.;FundamentalsofSoilMechanics;AsiaPublishingHouse,Mumbai

4. V.N.S.Murthy;SoilMechanics&FoundationEngineering;CRSPress,Taylor& FrancisGroup, New York

5. GopalRanjan,RaoA.S.R.;Basicandappliedsoilmechanics;Newageint.(p)ltd.

6. DasBrajaM;PrinciplesofGeotechnicalEngineering;ThomsonAsiaPvt.Ltd.

III Year-II Semester

L	T	P	C
3	0	0	3

TRANSPORTATION SAFETY AND ENVIRONMENT
(Professional Elective– II)

UNIT-I

Trends in roads and highways development. Problem of road accidents in India.Characteristicsof road accidents.Causes of accidents. Global and Indian road safety scenario. Factors responsiblefor successstoriesinroadsafety.Role ofhighway professionalsinhighwaysafety.

UNIT-II

Planning ofroads for safety. Land use planning andzoning. Developmentcontrol and encroachment.
Networkhierarchy.Routeplanningthroughcommunities.Accesscontrol.Trafficsegregation.Traffic calming designing for safety: road link design, alignment design. Cross-sectional elements. Traffic control devices. Road side safety. Road side facilities. Somecritical elements. Junction design Basic principles.Selection ofjunctiontype. Factors affecting safety at various junctiontypes. Elements to improveroadsafety.Provisions forvulnerable roadusers.

UNIT-III

Road safety audit. Concepts of road safety audit, Road safety auditors & key personnel in RSA. Organizingandconductingaroadsafetyaudit.Exampleandcommonlyidentified. IssuesduringRSA, Roadsafetyauditreport. Development ofcost-effectiveofroadsafetyauditaccidentinvestigation and prevention. Basic strategies for accident reduction. Significance of accidentdata.Accident investigation and identification of potential sites for treatment. Problem diagnosis. Selection of countermeasures.Example of selection of counter measures. Detaileddesign and implementation of countermeasures.

UNIT-IV

Monitoring and evaluation non-engineering measures for road safety, behavioral counter measures, education.Trainingandpublicity. The goalofpolice traffic control activities. Strategyforroad safety management by police. Role of NGOs in road safety. Legal framework for roadsafety transport related pollution, noise pollution, air pollution, effects of weather conditions, vehicular emission parameters, pollution standards.

UNIT-V

EIA requirements of highway projects, world bank guidelines, EIA practices inIndia. Fuel crisis andtransportation, factors affecting fuel consumption, fuel economy in variousmodesoftransportation,varioustypesofalternativefuels.

RecommendedBooks:

(i) Traffic Engg.AndTransportPlanningbyL.R.Kadiyali,KhannaPublishers,Delhi.
(ii) HighwayEngg.ByS.K.Khanna&C.E.G.Justo,NewChandBros.,Roorkee.

III Year-II Semester

L	T	P	C
3	0	0	3

BRIDGE ENGINEERING
(Professional Elective– III)

CourseOutcomes:

Atthe end ofthecourse,the student willbeableto:

- DiscusstheIRCstandardliveloadsanddesignthedeckslabbridge.
- Analyseandboxpipeculvertsforthegivenloading anddetailtheboxculverts.
- Designanddetailthe T-Beambridges.
- Designand check thestabilityofpiersandabutments.
- Discussabouttheconstructiontechniquesofprecastmembers.

UNIT-I

GENERALCONSIDERATIONSFORROADBRIDGES:

Introduction – Site selection – Soil exploration for site – Selection of bridge type – Economical span – Number of spans – Determination of HFL – General arrangement drawing.

STANDARDSPECIFICATIONSFORROADBRIDGES:

Width of carriageway- Clearances- Loads to be considered- Dead load– I.R.C. standard live loads- Impact effect- Review of I.R.C. loadings- Application of live loads on deck slabs – Wind load–Longitudinal forces-Centrifugal forces-Horizontal forces due to water currents.

UNIT-II

CULVERTS:

Introduction, Analysis and design of box culverts- slab culverts – pipe culverts- Reinforcement detailing and bar bending schedule need to be prepared.

UNIT-III

REINFORCEDCONCRETET-BEAMBRIDGES:

Introduction–Analysis and Design of T – Beam Girder bridges- Reinforcement detailing and bar bending schedule need to be prepared.

UNIT-IV

DESIGNOFSUBSTRUCTURE:

Analysis and Design of Abutments and pier- Reinforcement detailing to be prepared.

UNIT-V

BRIDGEBEARINGS:

Bearings, forces on bearings, types of bearings design of elastomeric bearings, basics for selection of bearings. Construction techniques for Via–Ducts, Methods of erection - Pre-cast girders, Launching procedures, design of launching girders.

TextBooks:

1. Johnson victor D, Essentials of Bridge Engineering, 7th Edition, Oxford, IBH Publishing Co., Ltd., 2006.
2. Ponnuswamy,BridgeEngineering,4thEdition,McGraw-HillPublication,2008.
3. KrishnamRaju N., Design of Bridges, 4thEdition, Oxford and IBH Publishing Co., Ltd.,2008.

References:

1. Vazirani,Ratvani&Aswani,DesignofConcreteBridges,5thEdition,Khanna Publishers,2006.
2. JagadishT.R.&M.A.Jayaram,DesignofBridgeStructures,2ndEdition,2009.
3. 3. Swami Saran, Analysis and Design ofsub-structures,2ndEdition,OxfordIBH Publishing co Ltd.,2006.

III Year-II Semester

L	T	P	C
3	0	0	3

HYDRAULIC AND IRRIGATION STRUCTURES
(Professional Elective– III)

Course Objectives:

- To Study Modes Of Failure, Stability Analysis And Design Of Gravity Dam And Earth Dams.
- To Study Various Types Of Spillways And Their Suitability, Energy Dissipation Below Spillways
- To Study Seepage Theories And Their Applications In The Design Of Weirs On Permeable
- Foundations. To Study Functions, Types And Suitable Locations For Canal Falls, Canal Regulators And Cross Drainage Works.
- To Study about Component Parts and Their Functions.

Course Outcomes:

At The End Of The Course The Student Will Be Able To:

- Analyze The Stability Analysis And Design Of Gravity Dam And An Earth Dam.
- Suggest A Suitable Spillway At A Dam Site And Understand The Criteria For Design Of Stilling Basin For Energy Dissipation Under Spillway.
- Understand The Functions And Suitable Locations Of Canal Outlets, Canal Falls, and Canal Regulators And Cross Drainage Works And Design Of Weirs.
- Understand The Functions Of Component Parts Of A Hydroelectric Power Scheme.

SYLLABUS

Unit-I

Storage Works: Classification of Dams, Factors Governing Selection of Types of Dam, Selection of Site, Preliminary Investigation.

Gravity Dams: Forces acting on a Gravity Dam, Stability Criteria, Modes of Failure – Elementary and Practical Profiles, Stability Analysis, Principal and Shear Stress – Construction Joints, Openings in Dams – Galleries, Foundation Treatment of Gravity Dam.

Earth Dams: Types, Foundation for Earth Dams, Design of Earth Dams, Causes for Failure of Earth Dams, Criteria for Safe Design, Phreatic Line, Seepage Analysis – Seepage Control Through Body and Foundation.

Unit-II

Spillways: Essential Requirements, Spillway Capacity, Components, Types of Spillways and Their Working, Design of Ogee Spillway, Energy Dissipation Below Spill Way, Scour Protection, Use of Hydraulic Jump as Energy Dissipater – Design of Stilling Basins – USBR and IS Standard Basins; Spillway Crest Gates – Different Types.

Unit-III

Diversion Head Works: Types, Location and Components, Effects of Construction of Weirs on Permeable Foundation, Bligh's, Lanes and Khosla's Theories, Method of Independent Variables,

Design Principles of Weirs and Barrages, Design of Weirs on Permeable Foundations, Design of Vertical Drop Weir, and Silt Control Devices.

Unit-IV

Regulation Works: Canal Falls – Definition, Necessity and Location, Classification of Falls, Design Principles of Syphon Well Drop, Notch Fall, Sarada Fall, Straight Glacis Fall; Offtake Alignment; Cross Regulator and Distributary Head Regulator – Design of Cross Regulator and Distributor Head Regulator.

Unit-V

River Training Works: River Training and its Objectives, Classification of River Training Works, Marginal Embankment, Guide Banks, Groynes, Cutoffs, Bank Pitching, Launching Aprons, Miscellaneous Types of River Training Works.

Water Power Engineering: Development of Hydro Power in India, Assessment of Available Power, Utilization Factor, Load Factor, Diversity Factor, Storage and Pondage; Types of Hydro Power Schemes; Components of Hydel Schemes – Fore Bay, Intake Structure, Trash Racks, Surge Tanks; Water Hammer Pressure, Substructure and Superstructure of Power House..

Text Books

1. Irrigation and Water PowerEngineering byPunmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2. Irrigation Water Resources and Water Power Engineering by Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic Structures by Garg, S.K., Khanna Publishers.

Reference Book

1. Hand book of Applied Hydrology,Chow, V.T., McGraw-Hill Book Co.of a hydel project.

III Year-II Semester

L	T	P	C
3	0	0	3

REPAIR AND RETROFITTING OF STRUCTURES

(Professional Elective– III)

Course Objectives:
To learn various distress and damages to concrete and masonry structures

- To understand the importance of maintenance of structures
- To study the various types and properties of repair materials
- To assess the damage to structures using various tests
- To learn the importance and methods of substrate preparation
- To learn various repair techniques of damaged structures, corroded structures

Course Outcomes:
At the end of the course student will be able to

- Understand the properties of fresh and hardened concrete.
- Know the strategies of maintenance and repair.
- Get an idea of repair techniques.
- Understand the properties of repair materials
- Understand the retrofitting strategies and techniques

Unit-I
Materials: Construction chemicals, Mineral admixtures, Composites, Fibre reinforced concrete, High performance concrete, polymer-impregnated concrete.

Unit-II
Techniques to test the existing strengths: Destructive and non destructive tests on concrete.

Unit-III
Repairs of Multistory structures: Cracks in concrete, possible damages to the structural element-beams, slab, Column, Footings, etc., Repairing techniques like Jacketing, Grouting, External prestressing, Use of chemical admixtures, Repairs to the fire damaged structures.

Unit-IV
Foundation problems: Settlement of shallow foundations – repairs, sinking of piles, wells – repairs.

Unit-V
Corrosion of Reinforcement: Preventive measures – coatings –use of SBR modified cementitious mortar, Epoxy resin mortar, Acrylic modified cementitious mortar, flowing concrete.

Reference Books

1. Deterioration, Maintenance and Repair of Structures" by Johnson, McGraw Hill.
2. Concrete Structures: Repairs, water proofing and protection" by Philip H. Perkins, Applied sciences publications Ltd., London, pp.302.

3. Durability of concrete structure: Investigation, Repair, Protection" Edited by Geoffmang., E. & FN SPON, An imprint of Chapman & Hall, pp.270.
4. Deterioration, maintenance and Repair of structures" by Johnson, McGraw Hill, pp.375

III Year-II Semester

L	T	P	C
3	0	0	3

DISASTER MANAGEMENT
(Open Elective– II)

Course Outcomes:

- At the end of the course, the student shall be able to:
- Explain about concepts of disaster management and types of disasters
- Explain the Vulnerability profile of India & legal framework in India
- Discuss about early warning systems for disaster risk reductions
- Describe the policy and programmers for disaster risk reductions in India
- Demonstrate rescue and relief operation in India during disaster

UNIT–I

INTRODUCTIONTO DISASTER MANAGEMENT:

Definitions and concepts of Hazard, Vulnerability, Risk, Resilience, Concept of Disaster Management Cycle – Response, Recovery, Mitigation and Preparedness, Introduction to Various Hazards both Natural and Man-Made Hazards – Earthquakes, Cyclones, Droughts, Floods, Volcanoes, Coastal Hazards, Landslides, Forest Fires, Industrial Accidents, Biological Disasters, etc.., Climate Change, Global Warming.

UNIT–II

DISASTERMANAGEMENTININDIA:

Hazard and vulnerability profile of India, Disaster Management Act 2005, National Disaster Mitigation and Management Guideline on -National Policy on Disaster Management 2009, NDMA guidelines on Cyclones specifically, besides earthquakes, floods, urban floods, information systems, communication systems etc., Introduction to State Disaster Management Authorities.
Disaster Management in the World Scenario: Role of UNDRR, Role of UNISDR

UNIT–III

HAZARDANALYSIS:

Estimation of potential causes, characteristics and impact of Hazards. Geological Processes leading to natural hazards, Multi- Hazard Assessment, Short term and Long Term Prediction, Earlywarningsystemfordifferenthazards,RiskAnalysisforIndividuals,communities etc.RoleofRemoteSensing&GISinDisasterManagementanditsapplications,CaseStudies.

UNIT–IV **(10 Lectures)**

DISASTERRISKREDUCTION (DRR):

Assessing Vulnerabilities, Risk Assessment, Preparation of Exposure and Risk Database, Prevention and mitigation strategies for DRR, Framework of Disaster Risk Reduction.

Capacity Building Measures, Community Participation, Contemporary studies and work towards disaster risk reduction, Disaster Risk Reduction Plan.

UNIT-V **(10 Lectures)**

RESPONSEANDRECOVERY OPERATIONS:

Role of NDRF, Training of personnel, equipment necessary, public awareness creation, Mass Casualty Management, agencies involved in mass casualty management, Qualification and Duties of professionals, Response policy, Case Studies.

TEXT BOOKS:

1. H.K.Guptha,—Disastermanagement‖,2nd Edition,University Press,2001.
2. R.B.Singh(Ed),—DisasterManagement‖,RawatPublication,NewDelhi,2000.

REFERENCES:

1. S.Seetharaman,—ConstructionEngineeringandManagement‖,4th Edition,Umesh publications, New Delhi, 1999
2. Gupta,M.C.,—ManualsonNaturalDisastermanagementinIndia‖,NationalCentrefor Disaster Management, IIPA, New Delhi, 2002.
3. DisasterManagementGuidelines.GOI-UNDPDisasterRiskReductionProgramme(2009-2012).

III Year-II Semester

L	T	P	C
3	0	0	3

WATERSHED MANAGEMENT
(Open Elective– II)

Course Objectives:

- To give an overview of watershed management and principles of WSM.
- To impart knowledge on water resources and conjunction use of ground water and
- Surface water to meet water demand. To impart knowledge on river basin watershed management and ground water management.
- To expose students about social aspects of WSM such as public aspects participation and integrated development.
- To emphasis on conservation of water through recycle and reuse of waste water, water harvesting.
- To explain the interference of integrated watershed management for sustainable development.
- To expose students to applications of RS and GIS for watershed management.

Course Outcomes:

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

- Plan for sustainable development by proper use of all available water resources of a watershed for optimum production with minimum hazards to natural resources.
- Determine the various solutions to meet the water demand.
- Implement damage mitigation measures to control soil erosion.
- Adopt appropriate techniques or methods for water harvesting.
- Knowledge on determining effective watershed modeling.

SYLLABUS

Unit-I

Principles of Watershed Management: Basics concepts, Hydrology and water availability, Surface water, Groundwater, Conjunctive use, Human influences in the water resources system, Water demand, Integrated water resources system River basins Watershed Management Practices in Arid and Semi-arid Regions, Watershed management through wells, Management of water supply - Case studies, short term and long term strategic planning

Unit-II

Conservation of Water: Perspective on recycle and reuse, Waste water reclamation 25 Social Aspects of Watershed Management: Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies

Unit-III

Sustainable Watershed Approach: Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation

Unit-IV

Water Harvesting: Rainwater management - conservation, storage and effective utilization of rainwater, Structures for rainwater harvesting, roof catchment system, check dams, aquifer storage

Unit-V

Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management.

Text Books:

1. Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994.
2. Murty, J.V.S., Watershed Management, New Age Intl., New Delhi 1998.

Reference Books:

3. Allam, G.I.Y., Decision Support System for Integrated Watershed Management, Colorado State University, 1994.
4. Vir Singh, R., Watershed Planning and Management, Yash Publishing House, Bikaner, 2000.
5. American Society of Civil Engineers, Watershed Management, American Soc. of Civil Engineers, New York, 1975.

III Year-II Semester

L	T	P	C
0	0	3	1.5

ENVIRONMENTAL ENGINEERING LAB

COURSE OBJECTIVES:

Students will have:

1. To perform sampling procedure, determine pH, Conductivity of given water sample in the laboratory
2. To determine and estimate Hardness, Alkalinity, Acidity of given water sample in the laboratory
3. To determine and estimate Dissolved Oxygen, Turbidity, Total Solids, Total Dissolved Solids, Total Suspended Solids etc., of given water sample in the laboratory
4. To determine and estimate Iron, Nitrogen, Total Phosphorous, B.O.D, C.O.D of given waste water sample in the laboratory
5. To determine Optimum Coagulant Dose, Chlorides, Chlorine Demand, Coli form of given drinking water sample in the laboratory
6. To determine Percent of Available Chlorine in Bleaching, Residual Chlorine of given drinking water sample in the laboratory

COURSE OUTCOMES:

Upon successful completion of this course, students will get ability to:

1. Demonstrate sampling procedure and determine pH, Conductivity of given water sample in the laboratory
2. Estimate Hardness, Alkalinity, Acidity of given water sample in the laboratory
3. Estimate Dissolved Oxygen, Turbidity, Total Solids, Total Dissolved Solids, Total Suspended Solids etc., of given water sample in the laboratory
4. Estimate Iron, Nitrogen, Total Phosphorous, B.O.D, C.O.D of given waste water sample in the laboratory
5. Determine Optimum Coagulant Dose, Chlorides, Chlorine Demand, Coli form of given drinking water sample in the laboratory
6. Determine Percent of Available Chlorine in Bleaching, Residual Chlorine of given drinking water sample in the laboratory

Exp. No	Name of the Experiment
0	Water sampling methods for lab analysis
1	pH Metric Estimation of Acid By Base
2	Determination of Total Hardness By EDTA Method
3	Determination of Acidity Of Water Sample
4	Determination of Alkalinity Of Water Sample
5	Estimation of Dissolved Oxygen in Water Sample
6	Determination of Turbidity of Water
7	Determination of Iron By Thiocyanate Colorimetry
8	Conduct metric Estimation Of Acid By Base
9	Determination of Biochemical Oxygen Demand
10	Determination of Total Solids, Total Dissolved Solids and Total Suspended Solids
11	Determination of Optimum Coagulant Dosage
12	Determination of Chloride Content in the Given Sample

13	Determination of the percentage of Available Chlorine in Bleaching Powder
14	Determination of the Residual Chlorine

III Year-II Semester

L	T	P	C
0	0	3	1.5

TRANSPORTATION ENGG. LAB

COURSE OBJECTIVES:

Students will have

- To demonstrate tests on road aggregates which include, aggregate crushing value and
- Impact
- To demonstrate test on aggregate,specific gravity and water absorption, attrition test, abrasion test, shape tests to practice tests on bituminous materials which include viscosity test
- To demonstrate ductility test.
- To demonstrate softening point test
- To demonstrate flash and fire point tests
- To demonstrate penetration test, stripping test

COURSE OUTCOMES:

Students will get ability to:

- Determine coarse aggregate impact, crushing, abrasion and attrition values using different laboratory testing machines.
- Determine specific gravity, elongation and flakiness index values of coarse aggregates.
- Determine the attrition and water absorption of aggregate.
- Determine viscosity, flash and fire point and softening point of bitumen in laboratory.
- Determine ductility and penetration of bitumen using ductility testing machine & standard penetrometer respectively.
- Determine stripping value of bitumen in laboratory.

LIST OF EXPERIMENTS

A) ON ROAD AGGREGATES:

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

B) ON BITUMINOUS MATERIALS:

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

References:

1. S.K.Khanna&C.E.G.Justo Highway Engineering Lab manual

III Year-II Semester

L	T	P	C
0	1	2	2

BUILDING INFORMATION MODELLING

III Year-II Semester

L	T	P	C
2	0	0	-

TECHNICAL PAPER WRITING & IPR

Course Objectives

1. To develop an understanding of the structure, style, and ethics of technical and scientific writing.

2. To train students in effective academic communication, including research paper, thesis, and project report writing.

3. To create awareness about various forms of intellectual property and the process of securing IP rights.

4. To provide foundational knowledge on patents, copyrights, trademarks, and design rights.

5. To sensitize students about innovation, commercialization, and legal aspects of research.

Unit I:

Fundamentals of Technical Writing: Basics of technical communication, Types of technical documents: research papers, project reports, theses, Structure and components of a technical paper (Abstract, Introduction, Methods, Results, Discussion), Clarity, precision, and language usage in scientific writing, Ethics in writing: plagiarism, data falsification, multiple submissions

Unit II:

Writing for Publication Selection of journal/conference, understanding journal impact factor, indexing, and scope, Manuscript preparation and formatting guidelines, Submission process and peer review system, responding to reviewers and revisions

Unit III:

Presentation and Dissemination Preparing abstracts, posters, and oral presentations,Tools for formatting and referencing (LaTeX, MS Word, EndNote, Mendeley, Zotero), Best practices for graphical and tabular data representation, Collaboration and authorship ethics, Copyright and open-access publishing

Unit IV:

Introduction to IPR Definition and need for Intellectual Property, Categories: Patents, Copyrights, Trademarks, Trade Secrets, and Industrial Designs, Basic principles of patentability: novelty, non-obviousness, utility, National and international IPR organizations (WIPO, IPO, USPTO, EPO), IPR protection mechanisms in India

Unit V:

Patent Filing and Innovation Management Patent filing process in India and abroad, Patent search using free databases (Google Patents, Espace net, WIPO), Patent drafting basics: claims, specifications, drawings, Technology transfer and commercialization of IP, Role of incubation centers and start-up policy

Textbooks

1. M. Ashok Kumar & R. Murugesan, Research Methodology and IPR, Charulatha Publications.
2. R. N. Khandare, Research Methodology & IPR, S. Chand Publishing.
3. Michael Alley, The Craft of Scientific Writing, Springer.

Reference Books

1. B.L. Wadehra, Law Relating to Intellectual Property, Universal Law Publishing Co.
2. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets, Cengage Learning.
3. Day & Gastel, How to Write and Publish a Scientific Paper, Cambridge University Press.
4. Robin Jeffery & Michael Wilkinson, Publishing Research Successfully, SAGE.
5. Government of India: IPR Policy Documents and Patent Office Guidelines (available on
6. https://ipindia.gov.in)

Course Outcomes

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

- Write effective technical papers and reports that conform to academic and professional standards.
- Present technical information clearly and ethically in various formats (papers, posters, presentations).
- Understand the process of peer review and publishing in journals/conferences.
- Identify and explain different types of intellectual property and how they are protected.
- Apply knowledge of IPR to protect and commercialize their innovations responsibly**.**

B.Tech.–IV Year I Semester

S.No.	Category	Title	L	T	P	Credits
1	Professional Core	Finite Element Methods	3	0	0	3
2	Management Course-II	Construction Economics and Finance	2	0	0	2
3	Professional Elective-IV	a) Subsurface investigation and instrumentation	3	0	0	3
		b) Advanced Environmental Engineering				
		c) Design & drawing of Irrigation Structures				
4	Professional Elective-V	a) Advanced Structural Engineering	3	0	0	3
		b) Environmental Impact and Risk Assessment				
		c) Foundation on Expansive Soils				
5	Open Elective	Open Elective-III	3	0	0	3
6	Open Elective	Open Elective-IV	3	0	0	3
7	Skill Enhancement Course	Skills in Civil Engineering software. (STAADPRO/ETABS/CAD/REVIT/SAP)	0	1	2	2
8	Audit Course	Gender Sensitization	2	0	0	-
9	Internship	Evaluation of Industry Internship	-	-	-	2
		Total	**19**	**1**	**02**	**21**

S.No.	Open Elective - III
1	Building technology for engineers
2	Environmental impact assessment
S.No.	**Open Elective - IV**
1	Geo-Spatial Technologies
2	Solid waste management

B. Tech. IV Year II Semester

S.No.	Category	Title	L	T	P	Credits
1	PR	Internship and Project	-	-	24	12

IV Year-I Semester

L	T	P	C
3	0	0	3

FINITE ELEMENT METHODS

COURSE OBJECTIVES:

Students will have

• To understand the fundamentals of Finite Element Method (FEM) and its relevance to engineering analysis.

• To develop the ability to formulate and solve simple structural mechanics problems using FEM.

• To understand the concept of element formulation and stiffness matrices for trusses, beams, and frames.

• To apply FEM in two-dimensional problems including plane stress and plane strain conditions.

• To explore FEM application in heat transfer and dynamic analysis.

COURSE OUTCOMES:

Students will get ability to

1. Understand the basic concepts, historical background, and application areas of FEM.
2. Formulate and solve 1D structural problems including bars and trusses.
3. Apply FEM to analyze beam and frame structures.
4. Implement FEM concepts in 2D problems involving plane stress, plane strain, and axisymmetric conditions.
5. Apply FEM to problems in heat transfer and structural dynamics.

UNIT – I

Introduction to Finite Element Method- Introduction and overview of FEM – History and applications in civil engineering; Discretization process – nodes, elements, degrees of freedom; Basic steps of FEM; Comparison with other numerical methods.

UNIT – II

One-Dimensional Finite Element Analysis- Bar and truss elements – Derivation of stiffness matrix using direct and variational approach (Rayleigh-Ritz and Galerkin); Assembly of global stiffness matrix; Boundary conditions.

UNIT – III

Beam and Frame Elements: Beam elements – Hermite shape functions; Stiffness matrix of beam elements using Galerkin method; Application to simply supported and cantilever beams.

UNIT – IV

Two-Dimensional Finite Element Analysis- Basic concepts – CST (Constant Strain Triangle) and LST (Linear Strain Triangle); Shape functions, strain-displacement matrix, stiffness matrix derivation; Plane stress and plane strain conditions; Axisymmetric elements.

UNIT – V

FEM in Structural Dynamics– Introduction to time-dependent problems and dynamic analysis; Mass matrix derivation, lumped and consistent mass matrices; Equation of motion; Modal analysis and natural frequencies.

Text Books:

1. "The Finite Element Methods in Engineering" by S.S. Rao, Publisher: Pergamon Press.
2. **"The Finite Element Method: Its Basis and Fundamentals"** – O.C. Zienkiewicz, R.L. Taylor, 7th Edition, Elsevier.

Reference Books:

1. **"A First Course in the Finite Element Method"** – Daryl L. Logan, 6th Edition, 2016, Cengage Learning.
2. **"Introduction to Finite Elements in Engineering"** – Tirupathi R. Chandrupatla and Ashok D. Belegundu, 4th Edition, Pearson Education.

IV Year-I Semester

L	T	P	C
2	0	0	2

CONSTRUCTION ECONOMICS AND FINANCE

Course Objectives:
The objective of the course is to
• To explain the basic concepts of construction economics and its role in project decision-making.
• To understand time value of money, cash flows, and investment appraisal techniques.
• To describe project cost estimation, budgeting, and cost control in construction projects.
• To explain sources of finance, financial statements, and profitability analysis.
• To understand risk, inflation, and economic viability assessment in construction projects.

Course Outcomes:
On completion of the course, the students will be able to:
1. understand the importance and application of economics in construction industry
2.analyze cash flows and evaluate project alternatives using engineering economic principles
3.estimate and control costs of construction projects effectively
4.interpret financial statements and assess project profitability
5.evaluate economic feasibility under risks and inflationary conditions

UNIT-I
Introduction to Construction Economics: Basic principles of economics – Demand and supply, elasticity, market structures; Construction sector and economic development; Role of construction economics in decision making; National income, GDP, cost of living indices; Productivity in construction.

UNIT-II
Time Value of Money and Economic Analysis- Concept of interest – Simple and compound interest; Time value of money; Present and future worth; Cash flow diagrams; Evaluation of investment alternatives – NPV, IRR, Payback period, Benefit-cost ratio; Comparison of mutually exclusive alternatives.

UNIT – III
Cost Estimation and Budgeting: Types of cost – Direct, indirect, fixed, variable; Cost estimation methods – Unit rate, empirical, and analytical methods; Preliminary and detailed estimates; Project budgeting; Cost control techniques – Earned Value Management (EVM); Break-even analysis.

UNIT – IV

Construction Finance and Accounting: Sources of finance – Equity, debt, internal accruals, loans, and advances; Public and private financing; Basics of financial statements – Income statement, balance sheet, cash flow statement; Working capital management; Ratio analysis and financial performance indicators.

UNIT-V

Risk, Inflation and Project Viability: Risk and uncertainty in construction – Types of risks, risk assessment and mitigation; Inflation – Causes and effects on project cost and returns; Sensitivity analysis; Economic feasibility and viability studies; Life cycle costing.

Text Books:

• Construction Planning, Equipment and Methods – R.L. Peurifoy, Clifford J. Schexnayder, 8th Edition, McGraw Hill.

• Engineering Economy – E.P. DeGarmo, W.G. Sullivan, and J.A. Bontadelli, 15th Edition, Pearson.

References:

• Construction Project Management – Theory and Practice – Kumar Neeraj Jha, 2nd Edition, Pearson.

• Financial Management – I.M. Pandey, 11th Edition, Vikas Publishing House.

• Project Planning, Analysis, Selection, Financing, Implementation and Review – Prasanna Chandra, Tata McGraw Hill.

IV Year-I Semester

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SUBSURFACE INVESTIGATION AND INSTRUMENTATION
(Professional Elective– IV)

COURSE OBJECTIVES
Students will have
- To provide an understanding of the purpose, scope, and planning of subsurface investigations for civil engineering projects.
- To familiarize students with various soil sampling methods, boring techniques, and groundwater table identification.
- To explain the procedures, applications, and interpretations of field penetration tests such as SPT, CPT, and pressure meter tests.
- To impart knowledge on rock exploration, sampling, and classification based on mechanical properties.
- To introduce students to advanced non-destructive testing methods for subsurface evaluation and geotechnical monitoring.

COURSE OUTCOMES:
After completion of this course students will be able to
1. Understand the requirements and methods for conducting soil investigations and plan appropriate exploration programs.
2. Apply knowledge of soil boring, sampling methods, and groundwater level detection in field investigations.
3. Perform and interpret results from penetration tests such as SPT, CPT, vane shear, and pressure meter tests.
4. Evaluate rock properties using rock quality designation (RQD) and geoengineering classification systems.
5. Utilize non-destructive testing techniques to assess subsurface conditions and monitor ground behavior.

UNIT I:
Introduction: Data required for soil investigation - Methods of Exploration - Planning Exploration Program.

UNIT II:
Sampling and Programme: Soil Boring - Soil Samplers and Sampling - Underwater Sampling Groundwater Table (GWT) Location - Number and Depth of Borings - Drilling and/or Exploration of Closed Landfills or Hazardous Waste Sites – Preparation of Soil Report.

UNIT III:
Penetration Tests: Standard Penetration Test - SPT Correlations - Design N Values - Cone Penetration Tests - Field Vane Shear Testing - Borehole Shear Test - Flat Dilatometer Test -

Pressure meter Test.

UNIT IV:

Rocks: Rock Sampling – RQD – Strength and modulus from classifications, Classification based on strength & modulus and strength and fracture strain, Geoengineering classification.

UNIT V:

Non-Destructive testing: Techniques–sounding techniques, Rader techniques, Ultrasonic pulse wave tests, Bender elements etc.

Text Books:

1. **Murthy, V.N.S. –** *Soil Mechanics and Foundation Engineering*, CBS Publishers.
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi, 2009.
3.Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, Sixteenth edition, 2017.

References:

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
2. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork.
3. **Donald P. Coduto –** *Geotechnical Engineering: Principles and Practices*, Pearson Education.

IV Year-I Semester

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ADVANCED ENVIRONMENTAL ENGINEERING
(Professional Elective– IV)

Course Objectives:

- The objective of the course is
- Provide advanced knowledge of water and wastewater treatment technologies.
- Explore design and operation of physical, chemical, and biological treatment units.
- Understand air pollution sources, control technologies, and modeling.
- Introduce solid and hazardous waste management techniques.
- Promote awareness on emerging contaminants, climate change, and environmental sustainability.

Course Outcomes:

Students will get ability to:

- Analyze and design advanced water and wastewater treatment processes.
- Evaluate air quality and apply pollution control methods and dispersion models.
- Apply knowledge of solid and hazardous waste management principles and regulations.
- Understand and address emerging environmental issues like micro-pollutants, e-waste, and climate impacts.
- Propose sustainable engineering solutions using environmental monitoring and management tools.

UNIT – I

Advanced Water and Wastewater Treatment: Systems of sanitation – relative merits & demerits– collection and conveyance of waste water – sewerage – classification of sewerage systems; – appurtenances in sewerage – cleaning and ventilation of sewers. Sludge treatment and disposal – digestion, dewatering, drying, and reuse.

UNIT – II

Air Pollution and Control: Sources and classification of air pollutants; Air quality standards and index; Sampling and monitoring of ambient air and stack emissions; Control devices – cyclone separators, ESPs, scrubbers, filters; Air pollution modeling – Gaussian plume model; Indoor air pollution.

UNIT – III

Solid and Hazardous Waste Management: Classification and characterization of municipal, industrial, and hazardous waste; Waste collection, transportation, recycling, and disposal methods; Composting, incineration, and landfilling; Biomedical and e-waste management; Legal frameworks and environmental regulations.

UNIT – IV

Environmental Impact of Emerging Contaminants: Occurrence, sources, and effects of pharmaceuticals, personal care products, microplastics, endocrine disruptors; Treatment options and challenges; Risk assessment; Environmental and health implications of nanomaterials and electronic waste.

UNIT – V

Disposal of sewage: Methods of disposal- disposal into water bodies- Oxygen sag Curve, Disposal into sea-disposal on land- sewage sickness**,** e-waste disposal, land fill, Septic Tanks, Imhoff tanks-working principles.

TEXT BOOKS:

1. **B.C. Punmia, Ashok Jain, Arun Jain –** *Environmental Engineering – Vol. I & II*, Laxmi publications.
2. **Metcalf & Eddy (AECOM) –** *Wastewater Engineering: Treatment and Resource Recovery*, McGraw Hill Education.

REFERENCES:

1. **M.N. Rao and H.V.N. Rao –** *Air Pollution*, Tata McGraw Hill.
2. **George Tchobanoglous, Hilary Theisen, and Samuel Vigil –** *Integrated Solid Waste Management*, McGraw Hill.
3. **Lawrence K. Wang, Yung-Tse Hung et al. –** *Handbook of Environmental Engineering*, Springer.
4. **Suresh K. Dhameja –** *Environmental Engineering and Management*, S.K. Kataria & Sons.
5. **BIS Codes –** IS: 10500 (Water Quality), IS: 2490 (Effluent Standards), IS: 11255 (Air Quality), CPCB Guidelines.

IV Year-I Semester

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DESIGN & DRAWING OF IRRIGATION STRUCTURES
(Professional Elective– IV)

COURSE OBJECTIVES:

The objective of the course is

- Enable students to understand the functional and structural aspects of major irrigation structures.
- Impart knowledge on the design principles and procedures of hydraulic structures.
- Develop drawing and detailing skills required for civil engineering irrigation works.
- Train students to interpret data and apply IS codes and design standards.
- Prepare students to work with practical aspects of irrigation and water resources engineering.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1.Understand the types and functions of various irrigation structures.

2.Design key hydraulic components like canal falls, regulators, cross-drainage works, and headworks.

3.Interpret hydrological and hydraulic data for structure design.

4.Prepare detailed drawings of irrigation structures using manual or CAD tools.

5.Apply IS codes and technical standards in the practical design of field structures.

UNIT – I

Design of Canal Regulation Works- Design principles of canal falls, regulators, and escapes; Types of canal falls (notch, trapezoidal, glacis, etc.); Design of canal regulator with cross and head regulators; Design of canal escape structures; Introduction to drawing techniques and detailing.

UNIT – II

Design of Cross Drainage Works- Classification and necessity – aqueducts, super passages, syphon aqueducts, and level crossings; Hydraulic and structural design principles; Balancing depth and economical cross section; Layout and drawing of a typical cross drainage work.

UNIT – III

Design of Diversion Headworks- Components – weir, barrage, fish ladder, guide banks, divide wall, under sluices; Design of weirs on permeable foundations (Bligh's, Khosla's theories); Determination of uplift pressure and floor thickness; Drawing of a typical weir or barrage.

UNIT –IV

Design of Canal Structures- Design of canal falls and cross regulators in distributaries; Canal outlets – types and working; Design and drawing of a typical cross regulator-cum-outlet structure; Detailing of structural components.

UNIT - V

Preparation of Working Drawings- Standard specifications, scales, symbols, and conventions; Preparation of longitudinal sections, cross-sections, and plan views of irrigation structures using drawing sheets or AutoCAD; Detailing of reinforcement, gates, and other components.

TEXT BOOKS:

1.Design of Irrigation Structures – S.K. Sharma, S. Chand & Company.

2.Irrigation Engineering and Hydraulic Structures – Santosh Kumar Garg, Khanna Publishers.

REFERENCES:

1.Irrigation Engineering – B.C. Punmia & Pande B.B. Lal, Laxmi Publications.

2.Water Resources Engineering – Principles and Practice – Satyanarayana Murthy Challa, New Age International.

3.Manual on Canal Structures – Central Water Commission (CWC), Govt. of India.

4.Relevant IS Codes – IS: 4997, IS: 783, IS: 4410 (Parts), etc.

IV B.Tech I Semester

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ADVANCED STRUCTURAL ENGINEERING
(Professional Elective– V)

Course Learning Objectives:

The objective of this course is:

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

Course Outcomes:

- At the end of this course; the student will be able to
- Differentiate Determinate and Indeterminate Structures
- Analyze the load effect on arches
- Carryout lateral Load analysis of structures
- Analyze Cable and Suspension Bridge structures
- Analyze structures using Moment Distribution, Kani' s Method and Matrix methods

UNIT I: Three Hinged Arches: Elastic theory of arches – Eddy' s theorem Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches.

UNIT-II: Lateral Load Analysis Using Approximate Methods: application to building frames. (i) Portal Method (ii) Cantilever Method.

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

UNIT – IV: Moment Distribution Method: Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal

frames – including Sway-Substitute frame analysis by two cycles. Kani' s Method: Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway.

UNIT – V: Introduction to Matrix Methods: Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements. Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

Text Books:

1. Structural Analysis, R.C. Hibbeler, Pearson Education, India
2. Theory of Structures – II, B. C. Punmia, Jain & Jain, Laxmi Publications, India.
3. Structural Analysis, C.S. Reddy, Tata Mc-Graw hill, New Delhi.

References:

1. Intermediate Structural Analysis, C. K. Wang, Tata McGraw Hill, India
2. Theory of structures, Ramamuratam, Dhanpatrai Publications.
3. Analysis of structures, Vazrani & Ratwani – Khanna Publications.

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IV B.Tech I Semester

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ENVIRONMENTAL IMPACT AND RISK ASSESSMENT
(Professional Elective– V)

Course Learning Objectives:

The objective of this course is:

1. Define and Classify Environmental Impacts and the terminology
2. Understands the environmental Impact assessment procedure
3. Explain the EIA methodology
4. List and describe environmental audits

Course Learning Outcomes

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

1. Identify the environmental attributes to be considered for the EIA study
2. Formulate objectives of the EIA studies
3. Identify the methodology to prepare rapid EIA
4. Prepare EIA reports and environmental management plans

UNIT- I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II

EIA Methodologies: Environmental attributes-Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.

Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria- case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCES:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – **Prentice Hall Publishers**
2. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.

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IV Year-I Semester

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FOUNDATIONS ON EXPANSIVE SOILS
(Professional Elective– V)

COURSE OBJECTIVES:

The objective of the course is

- To introduce the behavior and engineering properties of expansive soils
- To understand the challenges associated with foundations constructed on expansive soils.
- To analyze soil-structure interaction problems related to shrink-swell behavior.
- To study ground improvement techniques suitable for expansive soils.
- To design shallow and deep foundations for structures on expansive soil formations.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Identify and classify expansive soils based on their index and engineering properties.
2.. Analyze the swelling potential and heave of expansive soils.
3. Understand the mechanism of distress in structures founded on expansive soils.
4. Evaluate and implement suitable ground improvement techniques.
5. Design safe and cost-effective foundations on expansive soils using various mitigation methods.

UNIT – I

Introduction to Expansive Soils- Definition and characteristics of expansive soils – Mineralogical composition – Swell-shrink behavior – Identification and classification methods – Field and laboratory tests (Free swell index, Swell pressure test, Atterberg limits, etc.) – Case studies of structural damage due to expansive soils.

UNIT – II

Swelling Potential and Heave Estimation- Mechanism of swelling – Factors affecting swell potential (moisture, compaction, stress) – Estimation of swell pressure and heave – Oedometer tests – Empirical methods – Heave prediction models – Seasonal moisture variation and its effects.

UNIT – III

Foundation Problems and Structural Distress- Types of structural damage caused by expansive soils – Cracking in floors, walls, and pavements – Differential heave – Soil-structure interaction – Remedial and preventive measures – Design considerations for lightly and heavily loaded structures.

UNIT –IV

Foundation Solutions and Design Approaches- Shallow foundations – Design modifications (under-reamed piles, void formers, moisture barriers) – Raft foundations – Deep foundations in expansive soils – Use of piers and grade beams – Code provisions and design guidelines (IS:

2911, IS: 13094) – Case studies.

UNIT - V

Ground Improvement Techniques for Expansive Soils- Standard specifications Compaction control – Pre-wetting – Chemical stabilization (lime, cement) – Geosynthetics and membranes – Replacement techniques – Soil moisture control measures – Drainage control – Use of reinforced soil beds and barriers – Innovative methods.

TEXT BOOKS:

1. Foundation Engineering for Expansive Soils – John Nelson & David J. Miller, Wiley India.
2. Expansive Soils: Problems and Practice in Foundation and Pavement Engineering – Amer Ali Al-Rawas & Mattheus F.A. Goosen, Taylor & Francis.

References:

1. **Basic and Applied Soil Mechanics –** Gopal Ranjan and A.S.R. Rao, New Age International.
2. **Foundation Engineering –** P.C. Varghese, PHI Learning Pvt. Ltd.
3. **Soil Mechanics and Foundations –** B.C. Punmia, Laxmi Publications.
4. **IS 13094:1992 –** Guidelines for Selection of Ground Improvement Techniques for Foundation Soils.
5. **IS 2911 (Part 3):1980 –** Design and Construction of Under-reamed Piles.

IV B.Tech I Semester

L	T	P	C
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BUILDING TECHNOLOGY FOR ENGINEERS
(Open Elective– III)

Course Learning Objectives:

The objective of this course is:

- This course covers the essential principles, tools, and technologies that engineers use in the design, construction, and management of building projects.
- Topics range from traditional construction methods to cutting-edge technologies in the construction industry.
- By the end of this course, students will have a strong understanding of how to incorporate modern technologies into the engineering process.

Course Learning Outcomes

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

- Understand the key technologies used in modern building and construction. Identify the risks and impacts of a project
- Develop proficiency in using engineering tools for design, simulation, and project management.
- Learn about innovations such as smart buildings, automation in construction, and sustainable materials.

UNIT – I

Introduction to Building Technology: Overview of building technology, History of construction technologies, Current trends in construction engineering (e.g., BIM, smart cities), Materials used in construction (concrete, steel, wood, etc.), Properties and testing of building materials.

UNIT – II

Building Design and CAD Tools: Introduction to CAD and BIM (Building Information Modeling), Tools for 2D and 3D design (AutoCAD, Revit), Digital design workflows, Smart building systems (energy management, automation, IoT), Sustainable materials and green building practices.

UNIT – III

Engineering Construction Management Tools: Project management software (e.g., Primavera, MS Project), Scheduling, cost estimation, and resource allocation, Construction workflow and logistics, Drones for surveying and monitoring, 3D printing in construction.

UNIT – IV

Structural and Mechanical Systems in Buildings: HVAC, plumbing, and electrical systems, Integration of mechanical systems in building design, Simulation and analysis of building systems, Safety standards in building construction (OSHA, ISO standards).

UNIT – V

Advanced Technologies in Building: AI and machine learning applications in construction, Augmented Reality (AR) and Virtual Reality (VR) for engineers, Internet of Things (IoT) for building management, Smart cities and infrastructure development.

TEXT BOOKS:

1. Building Materials, S. S. Bhavikatti, Vices publications House private ltd.
2. Building Materials, B. C. Punmia, Laxmi Publications private ltd.

REFERENCES:

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

IV B.Tech I Semester

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ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective– III)

Course Learning Objectives:

The objective of this course is:

1. To impart knowledge on different concepts of Environmental Impact Assessment
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIA methods
4. To pre-requisites for ISO 14001 certification
5. To know the procedures for environmental clearances and audit

Course Learning Outcomes

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

1. Prepare EMP, EIS, and EIA report
2. Identify the risks and impacts of a project
3. Selection of an appropriate EIA methodology
4. Evaluation the EIA report
5. Estimate the cost benefit ratio of a project

UNIT – I

Basic concept of EIA: Elements of EIA – factors affecting EIA-Initial environmental Examination – life cycle analysis preparation of Environmental Base map Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA

UNIT – II

E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP

UNIT-III

Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts

on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT – V

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation. Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment advantages of Environmental Risk Assessment

TEXTBOOKS:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)

2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.

REFERENCES:

3. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

4. Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.

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IV B.Tech I Semester

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GEO-SPATIAL TECHNOLOGIES
(Open Elective– IV)

Course Learning Objectives:

The objective of this course is:

1. To Analyze and interpret satellite images for civil engineering applications using Remote Sensing techniques
2. Apply GIS tools and spatial analysis for solving civil engineering problems like land use planning, watershed management, and disaster mitigation.
3. Demonstrate the ability to integrate GPS, RS, and GIS for data collection and real-time applications.

Course Learning Outcomes:

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

1. Engineering knowledge.
2. Design/development of solutions.
3. Conduct investigations of complex problems.

Unit I: Introduction to Geospatial Technologies

Definition and Scope of Geospatial Technologies Components of Geospatial Technology: GIS, GPS, and Remote Sensing Applications in Civil Engineering, Environmental Studies, Urban Planning, etc. History and Development of Geospatial Technologies Overview of Earth's Coordinate Systems and Map Projections

Unit II: Remote Sensing

Principles of Remote Sensing Electromagnetic Spectrum and its Interaction with Atmosphere and Earth Surface Types of Satellites and Sensors (Landsat, IRS, Sentinel, etc.) Image Interpretation – Visual and Digital Techniques Resolution – Spatial, Spectral, Temporal, and Radiometric Applications in Land Use, Disaster Management, and Environmental Monitoring

Unit III: Geographic Information System (GIS)

Components of GIS – Hardware, Software, Data, People, and Methods Types of GIS Data – Raster and Vector Spatial and Attribute Data Input, Editing, and Data Quality Spatial Analysis – Overlay, Buffering, and Query Applications of GIS in Urban Planning, Infrastructure Development, and Resource Management

Unit IV: Global Positioning System (GPS)

Fundamentals of GPS Segments – Space, Control, and User Segments GPS Signal Structure and Positioning Techniques Differential GPS (DGPS) and Real-Time Kinematic GPS (RTK) Sources of Errors and Accuracy Enhancement Applications in Surveying, Navigation, and Fleet Management

Unit V: Integration and Applications of Geospatial Technologies

Integration of Remote Sensing, GIS, and GPS Web GIS and Mobile GIS Geospatial Data Standards and Metadata Recent Trends: UAV-based Mapping, LiDAR, and Cloud GIS Case Studies in Civil Engineering: Watershed Management, Smart Cities, Infrastructure Monitoring

Suggested Textbooks:

1. **Basudeb Bhatta –** *Remote Sensing and GIS*, Oxford University Press
2. **George Joseph –** *Fundamentals of Remote Sensing*, Universities Press
3. **K. S. Jayaraman –** *Remote Sensing and GIS*, Wiley India
4. **Lillesand, T.M., Kiefer, R.W., and Chipman, J.W. –** *Remote Sensing and Image Interpretation*, Wiley
5. **Chang, Kang-tsung –** *Introduction to Geographic Information Systems*, McGraw-Hill

IV B.Tech I Semester	L	T	P	C
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SOLID WASTE MANAGEMENT
(Open Elective– IV)

Course Learning Objectives:

The objective of this course is:

4. To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste.
5. To acquire the principles of treatment of municipal solid waste
6. To know the impact of solid waste on the health of the living beings
7. To learn the criterion for selection of landfill and its design
8. To plan the methods of processing such as composting the municipal organic waste.

Course Learning Outcomes:

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

4. Design the collection systems of solid waste of a town
5. Design treatment of municipal solid waste and landfill
6. To know the criteria for selection of landfill
7. To characterize the solid waste and design a composting facility
8. Processing and composting the municipal organic waste.

UNIT- I

Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT- II

Basic Elements In Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

UNIT- III

Transfer and Transport: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

UNIT- IV

Separation and Transformation of Solid Waste: Unit operations used for separation and transformation: shredding - materials separation and recovery, source reduction and waste minimization.

UNIT- V

Processing and Treatment: Processing of solid waste - Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

TEXTBOOKS

1. George Techobanoglous "Integrated Solid Waste Management", McGraw Hill Publication, 1993
2. Charles A. Wentz; "Hazardous Waste Management", McGraw Hill Publication, 1995.

REFERENCES

1. Vesilind, P.A., Worrell, W., Reinhart, D. "Solid **Waste Engineering", Cenage learning, New Delhi, 2004**

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IV Year - I Semester

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ETABS
(Skill Enhancement Course)

Course Learning bjectives:

The course is designed to

1. Learn to analyze 2 D frame steel tubular truss using structural analysis software
2. Learn to analyze 3D frame steel tubular truss using structural analysis software
3. Learn to analyze 2 D and 3D frame RCC frame using structural analysis software
4. Learn to analyze design of beams at various loading and support condition
5. Learn to analyze simple towers

Course outcomes:

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

1. Understand the stresses and forces output
2. Read the design output
3. Understand steel detailing
4. Understand the quantities
5. Use structural analysis software to analyze and design 2d and 3d frames

EXPERIMENTS:

1. Introduction to ETABS
2. Creating model: using grid system, assigning supports, assigning loads, assigning properties.
3. Assigning load combinations as per limit state of collapse and limit state of serviceability
4. Multistoried building subjected to wind loads
5. Multistoried building subjected to earth quake loads as per IS:1893-2016 load combinations
6. Complete design of multistoried building as per Indian codes
7. Analysis of output
8. Making project report using ETABS

Reference Books:

1. ETABS 2016 Black Book By Gaurav Verma
2. CSI Analysis Reference Manual for Sap2000, Etabs

IV B.Tech I Semester	L	T	P	C
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GENDER SENSITIZATION
(Audit Course)

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.

Unit - I:

Understanding Gender

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II:

Gender Roles And Relations

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Unit – III:

Gender And Labour

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Unit – IV:

Gender - Based Violence

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life"

Unit – V:

Gender And Culture

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues- Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".

Text books:

1. **"*Towards a World of Equals: A Bilingual Textbook on Gender" written* by A.Suneetha,Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA

JNTU-GV COLLAGE OF ENGINEERING VIZIANAGARAM

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. COURSE STRUCTURE (R23)

SUBJECTS OFFERED by CIVIL ENGINEERING for HONORS DEGREE

S.No	Subject Name	Offered By
Pool-1		
1	Advanced Concrete Technology	CE
2	Matrix Analysis Of Structures	CE
3	Disaster Management And Mitigation Measures	CE
4	Structural Dynamics	CE
Pool-2		
1	Introduction to Engineering Seismology	CE
2	Bridge Design & Analysis	CE
3	Foundation Engineering	CE
4	Rock Mechanics	CE
Pool-3		
1	Intelligent Transport Systems	CE
2	Pavement Analysis & Design	CE
3	Advanced Pavement Materials	CE
4	Computer Simulation In Traffic Engineering	CE
Pool-4		
1	Construction Project Management	CE
2	Water Shed Planning & Development	CE
3	Soil Structure Interaction	CE
4	Advanced Surveying	CE

POOL-1

ADVANCED CONCRETE TECHNOLOGY

Course Learning Objectives:

The objective of this course is:

1. Learn the fundamental concepts of Bogues compounds and structures of cement.
2. Learn the concepts of Admixtures and types.
3. Learn Mix design and applications of Mix Design.
4. Learn the concepts of Durability of concrete
5. Learn different tests on hardened concrete

Course Outcomes:

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

1. Understand the fundamental concepts of Bogues compounds and structures of cement.
2. The concepts of Admixtures and types.
3. Understanding Mix design and applications of Mix Design.
4. The student will know about Durability of concrete
5. Performing and understanding different tests on hardened concrete

SYLLABUS:

UNIT- I

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

UNIT- II

CHEMICAL ADMIXTURES- Mechanism of chemical admixture, Plasticizers and super

Plasticizers and their effect on concrete property in fresh and hardened state, Marsh cone test for optimum dosage of super plasticizer, retarder, accelerator, Air-entraining admixtures, newgeneration super plasticiser.

MINERAL ADMIXTURE-Fly ash, Silica fume, GCBS, and their effect on concrete property in fresh state and hardened state.

UNIT - III

MIX DESIGN - Factors affecting mix design, design of concrete mix by BIS method using IS10262 and current American (ACI)/ British (BS) methods. Provisions in revised IS10262-2004.

UNIT - IV

DURABILITY OF CONCRETE - Introduction, Permeability of concrete, chemical attack,acid attack, efflorescence, Corrosion in concrete. Thermal conductivity, thermal diffusivity, specific heat. Alkali Aggregate Reaction, IS456-2000 requirement for durability.

UNIT - V

Test on Hardened concrete -Effect of end condition of specimen, capping, H/D ratio, rate ofloading, moisture condition. Compression, tension and flexure tests. Tests on composition of hardened concrete-cement content, original w/c ratio. NDT tests concepts-Rebound hammer, pulse velocity methods.

TEXT BOOKS:

1. Properties of Concrete- Neville, A.M. - ELBS Edition, Longman Ltd., London
2. Concrete Technology- M.S. Shetty

REFERENCE BOOKS:

1. Concrete Technology- A.R. Santhakumar,-Oxford University Press.
2. Concrete Mix Design- N. Krishna Raju - Sehgal Publishers

MATRIX ANALYSIS OF STRUCTURES

Course Learning Objectives:

The objective of this course is:

1. Learn the fundamental concepts of matrix structural mechanics, such as the stiffness method.
2. The concepts of structural analysis learnt in mechanics of solids and structures course.
3. Understanding the analysis of statically determinate and indeterminate structures such as trusses,beams, frames and plane stress problems.
4. Learn the concepts of the stiffness method and apply it to a variety of structural problems involvingtrusses, beams, frames, and plane stress.
5. Learn the concepts of the trusses and frames

Course Outcomes:

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

1. Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent deformations, force and equilibrium methods.
2. Perform structural analysis using the stiffness method.
3. Solve multiple degree of freedom two dimensional problems involving trusses, beams, frames andplane stress.
4. Aware of the stiffness method and apply it to a variety of structural problems involving trusses,beams, frames, and plane stress
5. Aware of the trusses and frames

SYLLABUS:

UNIT-I

Introduction of Matrix methods of analysis – Properties of Matrices, singular matrix, Rank of a Matrix and Rank deficiency- Static indeterminacy and Kinematic indeterminacy – Degree of freedom – Structureidealization- stiffness and flexibility methods – Suitability.

UNIT-II

Generation Element stiffness matrix for truss element, beam element and torsional element- Element force

- displacement equations.

UNIT-III

Stiffness method for beam Elements – Element and global stiffness equation

– coordinate transformation and global assembly – structure stiffness matrix equation – analysis of continuous beams.

UNIT-IV

Stiffness method for plane trusses and Grid elements – development of stiffness matrix – coordinate transformation. Examples of pin jointed trusses and simple grid problems.

UNIT-V

Space trusses and frames - Member stiffness for space truss and space frame– Transformation matrix from Local to Global – Analysis of simple trusses, beams and frames.

TEXT BOOK :

1. 'Matrix Methods of Structural Analysis' by Pundit and Gupta
2. 'Matrix Methods of Structural Analysis'by Weaver and Gere, CBS Publishers.

REFERENCES:

1. 'Matrix analysis of structures' by Robert E Sennet- Prentice Hall- Englewood cliffs-New Jercy.
2. 'Advanced structural analysis' by Dr. P. Dayaratnam- Tata Mc Graw hill publishing company

DISASTER MANAGEMENT AND MITIGATION MEASURES

Course Learning Objectives:

The objective of this course is:

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

Course Outcomes:

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

1. Affirm the usefulness of integrating management principles in disaster mitigation work
2. Distinguish between the different approaches needed to manage pre- during and post- disaster periods
3. Explain the process of risk management
4. Relate to risk transfer
5. Understand the tools of post-disaster management.

SYLLABUS:

UNIT-I

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

UNIT-II

Man Made Disaster and Their Management Along with Case Study Methods Of The Following: Fire hazards – transport hazard dynamics –solid waste management – post disaster – bio terrotirism - threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their

management.

UNIT-III

Role Of Technology In Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges-mitigation programme for earth quakes –flowchart, geospatial information in agriculture drought assessment

UNIT-IV

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

UNIT-V

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

TEXT BOOKS:

1. 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy(2009),Universities press.
2. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.

REFERENCE BOOKS:

1. 'Disaster Management' edited by H K Gupta (2003),Universities press.
2. 'Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007)

STRUCTURAL DYNAMICS

Course Learning Objectives:

The objective of this course is:

1. Develop an understanding of why and how the structural dynamics is used.
2. Develop an awareness of theory of vibrations
3. Understand the Degree of freedoms
4. Describe the Vibrational analysis
5. Describe Earthquake analysis.

Course Outcomes:

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

1. Affirm the usefulness of structural dynamics.
2. Distinguish between the different approaches needed to understand the Vibrations and Dynamics
3. Explain the Degree of freedoms
4. Vibrational analysis practical Exposure is learned
5. Understand Earthquake analysis

UNIT I

Theory of vibrations: Introduction - Elements of vibratory system - Degrees of Freedom - Continuous System - Lumped mass idealization - Oscillatory motion - Simple Harmonic motion - Vectorial representation of S.H.M. - Free vibrations of single degree of freedom system - undamped and damped vibrations - critical damping

UNIT II

Introduction to Structural Dynamics : Fundamental objectives of dynamic analysis - Types of prescribed loading - Methods of discretization - Formulation of equations of motion by different methods – Direct equilibration using Newton's law of motion / D'Alembert's principle, Principle of virtual work and Hamiltonprinciple.

Single Degree of Freedom Systems : Formulation and solution of the equation of motion - Free vibration response - Response to Harmonic, Periodic, Impulsive and general dynamic loadings - Duhamel integral.

UNIT III

Multi Degree of Freedom Systems: Selection of the degrees of Freedom - Evaluation of structural property matrices - Formulation of the MDOF equations of motion - Undamped free vibrations - Solutions of Eigen value problem for natural frequencies and mode shapes - Analysis of Dynamic response – Normal co-ordinates

- Uncoupled equations of motion - Orthogonal properties of normal modes - Mode superposition procedure.

UNIT IV

Practical Vibration Analysis: Introduction - Stodola method - Fundamental mode analysis - Analysis of second and higher modes - Holzer method - Basic procedure.

Continuous Systems: Introduction - Flexural vibrations of beams - Elementary case – Derivation of governingdifferential equation of motion - Analysis of undamped free vibrations of beams in flexure - Natural frequencies and mode-shapes of simple beams with different end conditions - Principles of application to continuous beams.

UNIT V

Introduction to Earthquake Analysis: Introduction - Excitation by rigid base translation - Lumped mass approach - SDOF and MDOF systems - I. S. Code methods of analysis for obtaining response of multi storeyedbuildings.

TEXTBOOKS:

1. Dynamics of Structures by Clough & Penzien, McGraw Hill, New York
2. Structural Dynamics by Mario Paz, C.B.S Publishers, New Delhi.

REFERENCES:

1. Dynamics of Structures by Anil K. Chopra, Pearson Education (Singapore), Delhi.
2. I.S: 1893 - 1984, “Code of practice for Earthquake resistant design of Structures” and latest I.S: 1893
- 2002 (version) Part-1

POOL-2

Introduction to Engineering Seismology

Course Learning Objectives:

The objective of this course is:

1. Learn the fundamental concepts of engineering seismology.
2. The concepts of structural analysis learnt in mechanics of solids and Earthquake structures course.
3. Understanding the analysis of reinforced concrete design.
4. Learn the concepts of the Structural walls and non-structural elements.
5. Learn the concepts of the ductility considerations inn Earthquake design.

Course Outcomes:

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

1. Understand engineering seismology
2. Perform structural analysis using the stiffness method & Earthquake structures course
3. Learn analysis of reinforced concrete design.
4. Aware of the Structural walls and non-structural elements.
5. Aware of the ductility considerations inn Earthquake design.

SYLLABUSUNIT - I

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics-Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales-Energy released- Earthquake measuring instruments-Seismoscope, Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India.

UNIT - II

Conceptual design: Introduction-Functional planning-Continuous load path-Overall form-simplicity and symmetry-elongated shapes-stiffness . Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions-design earthquake loads-basic

load combinations-permissible stresses- seismic methods of analysis-factors in seismic analysis-equivalent lateral force method- dynamic analysis-response spectrum method-Time history method.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings- Seismic methods of analysis- Seismic deign methods- IS code based methods for seismicdesign.

UNIT - IV

Structural Walls and Non-Structural Elements: Strategies in the location of structural walls- sectional shapes-variations in elevation- cantilever walls without openings

UNIT - V

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920.

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of IndiaPvt. Ltd.

REFERENCES:

1. Seismic Design of Reinforced Concrete and Masonry Building – T. Paulay and M.J.N. Priestly, John Wiley& Sons
2. Earthquake –Resistant Design of Masonry Building –Miha Tomazevic, Imperial college Press.

BRIDGE DESIGN AND ANALYSIS

Course Learning Objectives:

The objective of this course is:

1. Learn the fundamental concepts of Concrete Bridges
2. The concepts of Solid slab Bridges
3. Understanding the analysis and design of Girder Bridges
4. Learn the concepts of the Pre stressed concrete bridges
5. Learn the concepts of Analysis of bridge decks.

Course Outcomes:

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

1. Understand concepts of Concrete Bridges
2. Understand Solid slab Bridges
3. Learn analysis and design of Girder Bridges.
4. Aware of the Pre stressed concrete Bridges
5. Aware of the concepts of Analysis of bridge decks.

SYLLABUSUNIT I

Concrete Bridges: Introduction-Types of Bridges-Economic span length-Types of loading-Dead load-live load-Impact Effect-Centrifugal force-wind loads-Lateral loads- Longitudinal forces-Sesmic loads - General Design Requirements.

UNIT II

Solid slab Bridges: Introduction-Method of Analysis and Design.

UNIT III

Girder Bridges: Introduction-Method of Analysis and Design-Courbon's Theory, Grillage analogy.

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UNIT IV

Pre-Stressed Concrete Bridges: Basic principles-General Design requirements-Mild steel reinforcement in prestressed concrete member-Concrete cover and spacing of pre- stressing steel-

Slender beams

UNIT V

Analysis of Bridge Decks: Harmonic analysis and folded plate theory-Grillage analogy- Finite strip method and FEM. Sub-srtucture of bridges: Substructure- Beds block-Piers- Pier Dimensions- Design loads forpiers-Abutments- Design loads for Abutments.

TEXT BOOKS:

1.Design of Concrete Bridges by M.G.Aswani, V.N.Vazirani and M.M.Ratwani.2.Bridge Deck Behaviour by E.C.Hambly

REFERENCES:

1. Concrete Bridge Design and Practice by V.K.Raina.
2. Dynamics of Structures by Clough & Penzien, McGraw Hill, New York

FOUNDATION ENGINEERING

Course Learning Objectives:

The objective of this course is:

1. To enable the student to appreciate how Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation.
2. To teach the student special methods of computation of settlements and the corrections to be applied to settlements.
3. To enable the student to understand the advanced concepts of design of pile foundations.
4. To teach the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.
5. To enable the student to learn the difference between isolated and combined footings, the determination of bearing capacity of mats and proportioning of footings.

Course Outcomes:

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

1. Compute the safe bearing capacity of footings subjected to vertical and inclined loads.
2. Understand the advanced methods of settlement computations and proportion foundation footings.
3. Appreciate the methods of computing the pull-out capacity and negative skin friction of pilesandcompute the settlements of pile groups in clays.
4. Appreciate the problems posed by expansive soils and the different foundation practices devised.
5. Appreciate the difference between isolated footings and combined footings and mat foundations.

SYLLABUS:

UNIT-I

Bearing capacity of Foundations using general bearing capacity equation – Meyerhof's, Brinch

Hansen's andVesic's methods.

UNIT-II

Settlement analysis: Immediate settlement of footings resting on granular soils – Schmertmann & Hartmanmethod – De Beer and Martens method - Immediate settlement in clays – Janbu's method – correction for

consolidation settlement using Skempton and Bjerrum's method – Correction for construction period.

UNIT-III

Mat foundations – Purpose and types of isolated and combined footings – Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in claysand granular soils – compensated rafts

UNIT-IV

Earth-retaining structures – cantilever sheet piles – anchored bulkheads – fixed and free earth support methods

– design of anchors – braced excavations – function of different components – forces in ties – stability againstbottom heave.

UNIT-V

Pile foundations – single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method.

TEXT BOOKS:

1. 'Soil Mechanics and Foundation Engineering' by VNS Murthy, CBS Publishers.2.'Principles of Foundation Engineering' by BM Das, Thomson Brooks/Cole.

REFERENCE BOOKS:

1. 'Foundation Analysis and Design' by JE Bowles, John Wiley.
2. Basic and applied soil mechanics' by Gopal Ranjan and ASR Rao, New Age Publishers.

ROCK MECHANICS

Course Learning Objectives:

The objective of this course is:

1. Learn the Classification on intact rock and rock masses.
2. The concepts of Filed shear test
3. Understanding the analysis and design underground openings
4. Learn the concepts strength and deformability of jointed rock mass.
5. Learn the concepts of Stability of rocks.

Course Outcomes:

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

1. Understand concepts of Classification on intact rock and rock masses.
2. Understand Filed shear test and Insitu stress methods
3. Learn analysis of Underground openings
4. Aware of the strength and deformability of jointed rock mass
5. Aware of the concepts of Stability of rocks

SYLLABUSUNIT I

Classification of Intact rock and Rock masses, Strength and modulus from classifications. Physico mechanicalproperties, Laboratory tests for various physical and mechanical properties.

UNIT II

Field shear test, Deformability tests in rock mass, State of stress in the ground. Insitu stress, various methodsof stress measurement, Hydrofracturing technique, Flat jack technique, Overcoring technique.

UNIT III

Underground opening in infinite medium, Elastic and elasto-plastic approach. Stress concentration for different shapes of opening, Zone of influence.

UNIT IV

Strength and deformability of jointed rock mass, Fracture strength of jointed rock mass. Shear strength of Rockjoints, Deformability of Rock joints, Concept of joint compliance.

UNIT V

Stability of rock slopes, Modes of failure, Plane failure, Wedge failure, Circular failure, Toppling failure.

TEXT BOOKS:

1. Introduction to Rock Mechanics by R.E.Goodman, John Wiley & Sons.
2. Engineering in Rocks for Slopes, Foundation and Tunnels, Editor T.Ramamurthy, Prentice Hall India Pvt.Ltd.

REFERENCES:

1. Fundamentals of Rock Mechanics, Fourth Edition, by Jaeger, Cook and Zimmerman, Blackwell Publishing.
2. Rock mechanics and the design of structures in rock, L. Obert and Wilbur I. Duvall, John Wiley & Sons,Inc.

POOL-3

INTELLIGENT TRANSPORTATION SYSTEMS

Course Objectives:

The objective of this course is to:

1. To learn the fundamentals of ITS
2. To understand the role of telecommunication in ITS
3. To study the ITS functional areas
4. To implement ITS in traffic operations
5. To have an overview of ITS implementation in developing countries

Course Outcomes:

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

1. Understand the sensor and communication technologies
2. To understand engineering technologies used in ITS
3. To apply various ITS methods in traffic operations
4. To analyze the role of ITS in-traffic Operations
5. Define the significance of ITS under Indian conditions

SYLLABUS:

UNIT I:

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

UNIT II:

Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Vehicle – Road side communication – Vehicle Positioning System.

UNIT III:

ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control

Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

UNIT IV:

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

UNIT V:

Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

TEXT BOOK:

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, JohnMiles.
2. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.

REFERENCES:

1. National ITS Architecture Documentation, US Department of Transportation, 2007 (CD-ROM).

PAVEMENT ANALYSIS & DESIGN

Course Objectives:

1. To understand Typical highway pavement structures
2. To understand stresses and strains due to loading
3. To evaluate Stresses in pavements
4. To design flexible pavement
5. To design rigid pavement

Course Outcomes:

1. Analyze the stresses and strains in a flexible pavement using multi-layered elastic theory.
2. Analyze stresses and strains in a rigid pavement using Westergaard's theory.
3. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods.
4. Design a rigid pavement using IRC, and AASHTO methods.
5. Design of joints, Dowel & tie bars

SYLLABUS

UNIT- I:

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT- II:

Stresses In flexible Pavement: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements; Stress In Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts;.

UNIT- III:

Stresses in Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, and Stresses in Dowel Bars & Tie Bars.

UNIT-IV:

Design of Flexible Pavements: Factors effecting Design. Deflection studies in Flexible Pavements. Present Serviceability Index. IRC guidelines for Flexible Pavements. Pavement Performance and methods- AASHTO and Asphalt Institute Method. Need for Overlays, Overlays design methods for Flexible and Rigid pavements.

UNIT – V:

Design Of Rigid Pavements: Factors effecting Design – Wheel load & its repetition, subgrade strength &proportion, strength of concrete- modulus of elasticity. Reinforcement in slab. Design of joints. Design of Dowel bars. Design of Tie bars. IRC and AASHTO methods of Rigid Pavement design

Text Book:

1. Yoder and Witczak, *Priniciples of Pavement Design*, John Wiley and Sons
2. Yang. H. Huang, *Pavement Analysis and Design*, Second Edition, Prentice Hall Inc.

References:

1. Rajib B. Mallick and Tahar El-Korchi, *Pavement Engineering – Principles and Practice*, CRC Press (Taylorand Francis Group)
2. W.Ronald Hudson, Ralph Haas and Zeniswki , *Modern Pavement Management*, Mc Graw Hill and Co.

ADVANCED PAVEMENT MATERIALS

Course Objectives:

The objective of this course is to:

1. To study the properties and test on aggregate,
2. To study the bituminous materials,
3. To study various Cement materials PCC mix design
4. To study the use of Composite materials
5. To study the use of recycled materials

Course Outcomes:

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

1. Understand the properties and test procedures of aggregate in pavement design
2. Know the different types of bituminous pavement construction and its principle
3. Understand the Cementing materials & PCC mix design
4. To analyze the importance in use of composite materials
5. To evaluate the cost and environmental benefits of recycled waste products

SYLLABUS:

UNIT I:

Aggregate: Nature and properties – aggregate requirements – types and processing – aggregates for pavement base – aggregate for bituminous mixture – aggregate for Portland Cement Concrete – lightweight aggregate – tests on aggregate – specification.

UNIT II:

Bituminous Materials: conventional and modified binders – production – types and grade – physical and chemical properties and uses – types of asphalt pavement construction – principles of bituminous pavement construction – tests on bituminous materials. Bituminous Mix design

– modified mixtures – temperature susceptibility and performance.

UNIT III:

Cement /concrete based materials: Cement – properties – PCC mix design and properties – modified PCC – Mix Design – Behaviour – Performance – Tests on Cement and Concrete mixes. High Performance Concrete – low shrinkage – increased strength.

UNIT IV:

Composites, Plastics and Geosynthetics: Plastics and polymerization process – properties – durability and chemical composition – Reinforced Polymer Composites – Geosynthetics – Dry

Powdered Polymers – Enzymes.

UNIT V:

Reclaimed / Recycled Waste Products: Reclaimed Materials – waste products in civil engineering applications – effect of waste products on materials, structure and properties – selfhealing and smart materials – locally available materials.

TEXT BOOKS:

1. P. T. Sherwood, Alternative Materials in Road Construction, Thomas Telford Publication,London
2. RRL, DSIR, Soil Mechanics for Road Engineers, HMSO, London

REFERENCES:

1. Koerner, R. M. Designing with Geosynthetics, Prentice Hall, Englewood Cliffs, New Jersey,U.S.A.
2. Shan Somayaji, Civil Engineering Materials, second edition, Prentice Hall Inc.

COMPUTER SIMULATION IN TRAFFIC ENGINEERING

Course Objectives:

The objective of this course is to:

1. To be introduced to systems approach and understand various methods
2. To learn the fundamentals of simulation and the GPSS language.
3. To learn the application of GPSS
4. To learn the implementation of GA & Fuzzy Logic
5. To be introduced to advanced computational techniques such as CAD

Course Outcomes:

Upon completion of this course, the students should have:

1. Understand various working models
2. Working knowledge of simulation and GPSS programming.
3. Application of GPSS
4. Good understanding of GA applications & Fuzzy Logic
5. The ability to apply CAD

SYLLABUS:

UNIT I:

Introduction to systems approach - Typical transportation systems - Mathematical models. Fundamentals of simulation - Monte Carlo method - Continuous and discrete models - Simulation languages. Probability concepts - Random numbers - Pseudo random generators –Arrival patterns - Service time distributions – Manual simulation of simple queuing system

UNIT II:

GPSS Fundamentals - Creating and moving transactions - Queues and facilities – Event scheduling – Standard numerical attributes – Parameters and save values - Functions – Priority

- Preemption - Collection of statistics - Report preparation. Internal logic of GPSS processor -Program control statements.

UNIT III:

Applications of GPSS - Simple queuing problems - Inventory problems - Simulation of ports -Railway platforms and level crossings - Traffic signals Analysis of simulation results

- Modelvalidation - Replication of random conditions - Time series analysis.

UNIT IV:

Genetic Algorithm - Terminology in GA – Strings, Structure, Parameter string – Data Structures – Operators - Algorithm – Application in Transportation. Fuzzy Logic.

UNIT V:

Computer Aided Drafting - DBMS concepts - Civil Engineering Databases – Data entry & Reports. Spreadsheet concepts – Worksheet calculations in Civil Eng, - Regression & Matrix Inversion, SPSS.

TEXT BOOK:

1. Gordon, G., System Simulation, Prentice-Hall of India
2. GPSS/PC, User Manual, Minuteman Software, USA

REFERENCES:

1. David E. Goldberg, Genetic Algorithms in Search, Optimisation and Machine Learning,Addison-Wesley
2. J.M. Zurada, .Introduction to artificial neural systems., Jaico Publishers.

Pool-4

CONSTRUCTION PROJECT MANAGEMENT

Course Learning Objectives:

The objective of this course is:

1. To introduce to the student the concept of project management including network drawing and monitoring
2. To introduce various equipment's like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
3. To introduce the importance of safety in construction projects
4. To introduce Hoisting and earthwork equipment's
5. To introduce Construction methods, earthwork, piling, placing of concrete

Course Outcomes:

1. Upon the successful completion of this course, the students will be able to:
2. Appreciate the importance of construction planning
3. Understand the functioning of various earth moving equipment
4. Know the methods of production of aggregate products and concreting and usage of machinery required for the works.
5. Apply the gained knowledge to project management and construction techniques

SYLLABUS:

UNIT- I Construction project management and its relevance – qualities of a project manager

– project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical Path Method – Applications

UNIT -II Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT- III Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling

equipment – calculation of truck production – compaction equipment – types of compaction rollers

UNIT –IV Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders

– scrapers– draglines - clamshell buckets.

UNIT -V Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixingand placing of concrete – consolidating and finishing

Construction methods – earthwork – piling – placing of concrete – form work – fabrication anderection – quality control and safety engineering

Text Books:

1. Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, TataMcgrawhill

2. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.

3. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.

References:

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor andFrancis

2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengagelearning.

3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

WATER SHED PLANNING AND DEVELOPMENT

Course Learning Objectives:

The objective of this course is:

1. To introduce to the student the concept of multidisciplinary approach for watershed management
2. To introduce about drainage, land use, vegetation, geology, soils, hydrology.
3. To introduce the importance of Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control.
4. To introduce surface flow harvesting, subsurface flow harvesting, stop dams.
5. To introduce Reclamation of saline and alkaline soils.

Course Outcomes:

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

1. Implement the concept of watershed development
2. Analyze the basic data on watersheds
3. Know the methods of Measures to Control Erosion
4. Apply the gained knowledge regarding techniques of rain water harvesting.
5. Understand Land use and Land capability classification

UNIT-I : Introduction

: Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

UNIT-II : Characteristics of Watersheds

: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-III : Principles of Erosion:

Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams , rock-fill dams, brushwooddam, Gabion.

UNIT-IV: Water Harvesting:

Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

UNIT-V: Land Management:

Land use and Land capability classification, management of forest, agricultural, grassland andwild land, land grading operation, Reclamation of saline and alkaline soils.

TEXT BOOKS

'Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.'Land and Water Management' by Murthy.VVN, Kalyani Publications, 2007. 'Watershed Management' by Murthy J V S, New Age International Publishers, 2006.

REFERENCES

'Water Resource Engineering'by Wurbs R A and James R A, Prentice Hall Publishers, 2002.'Watershed Hydrology' by Black P E, Prentice Hall, 1996.

SOIL STRUCTURE INTERACTION

Course Objectives:

1. To understand the behavior of soil and its interaction analysis with the structure.
2. to understand the Beam Behavior on Soil
3. To understand Elastic Continuum
4. To understand the loading of Axial & Lateral Load on Pile groups
5. To understand the effect of Foundation on soil

Course Outcomes:

1. Can analyze soil-structure interaction considering different models
2. To analyze the behavior of beams for various soil conditions and for different structures
3. To determine the effect of Elasticity of Soil under foundation
4. To analyze the loading effect on Pile Group
5. To determine the effect at soil structure due to different loading conditions

SYLLABUS

Unit-I : Soil-Foundation Interaction:

Introduction to soil-foundation interaction problems, Soil behaviour, Foundation behaviour, Interface behaviour, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic- plastic behaviour, Time dependent behaviour.

Unit-II : Beam on Elastic Foundation- Soil Models:

Infinite beam, Two-parameters models, Isotropic elastic half space model, Analysis of beams of finite length, combined footings.

Unit-III : Plates on Elastic Continuum:

Thin and thick rafts, Analysis of finite plates, Numerical analysis of finite plates.

Unit-IV: Analysis of Axially and Laterally Loaded Piles and Pile Groups:

Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap,

Load deflection prediction for laterally loaded piles, Subgrade reaction and elasticanalysis, Interaction analysis, Pile-raft system,

Unit-V : Ground – Foundation

Structure Interaction: Effect of structure on ground-foundation interaction, Static and dynamic loads.

TEXTBOOKS:

1. Selvadurai, A. P. S. – Elastic Analysis of Soil – Foundation Interaction,
2. Rolando P. Orense, Nawawi Chouw & Michael J. Pender – Soil – Foundation-Structure Interaction.

REFERENCES:

1. Poulos, H. G., and Davis, E. H. – Pile Foundation Analysis and Design
2. Bowles, J. E. – Foundation Analysis & Design
3. Das, B. M. – Principles of Foundation Engineering 5th Edition NelsonEngineering

WEBLINK

https://nptel.ac.in/courses/105/105/105105200/

ADVANCED SURVEYING

OBJECTIVE:

1. To understand the use of Astronomy
2. To understand the Vertical and titled photographs distortion in aerial photographs.
3. To understand the practical applications of total station
4. To understand the Field work procedure in GPS surveying
5. To understand the Rout surveys for highways, railways and waterways

Course Outcomes:

On completion of this course, the student shall be able to

1. Know the astronomical surveying
2. Do the photogrammetric surveying and interpretation
3. Solve the field problems with total station
4. Know the GPS surveying and the data processing
5. Understand the route surveys and tunnel alignments

UNIT I ASTRONOMICAL SURVEYING

Astronomical terms and definition – Motion of sun and stars – Celestial co-ordinate System - Time system - Nautical Alamance – Apparent attitude and corrections – Field observations and determinations of time, longitude, latitude and azimuth by attitude and Hour angle method.

UNIT II AERIAL SURVEYING

Terrestrial Photogrammetry – Terrestrial stereo photogrammetry – Aerial photogrammetry –overlaps – scale of photographs – Vertical and titled photographs distortion in aerial photographs – stereostopic vision - photo interpretation – Applications.

UNIT III TOTAL STATION SURVEYING

Classification – basic measuring and working principles of an Electro – optical and

Microwavetotal station- sources of errors in Electro – optical and Microwave total station – Care and Maintenance of total station – trilateration – Applications.

UNIT IV GPS SURVEYING

Basic concepts – Space, Control and User segments – Satellite configuration – Signal structure

–Orbit determination and representation – Anti spoofing and selective availability – hand heldand geodetic receivers – Field work procedure – Data processing Applications.

UNIT V MISCELLANEOUS

Reconnaissance – Rout surveys for highways, railways and waterways – simple, compound, reverse, transition and vertical curve – setting out methods - hydrographic surveying – tides –MSL – Sounding methods – measurement of current and discharge – Tunnel alignment and setting out – Settlement and Deformation studies.

TEXT BOOKS:

1. James M.Anderson and Edward M.Mikhail, " Surveying, Theory and Practice", 7th Edition,

McGraw Hill, 2001.

2. Bannister and S.Raymond, "Surveying", 7th Edition, Longman 2004.
3. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
4. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993

REFERENCES:

1. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2004.
2. Arora K.R. "Surveying Vol I & II", Standard Book House, 10th Edition 2008.
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer – Verlag, Berlin, 2003.
4. Seeber G, Satellite Geodesy, Water De Gruyter, Berlin,1998

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA

JNTU-GV COLLAGE OF ENGINEERING VIZIANAGARAM

DEPARTMENT OF CIVIL ENGINEERING

B.Tech. COURSE STRUCTURE (R23)

SUBJECTS OFFERED by CIVIL ENGINEERING for MINORS DEGREE

S.No	Subject Name	Offered By
Pool-1		
1	Repair And Rehabilitation Of Structures	CE
2	Building Planning And Drawing	CE
3	Building Materials	CE
4	Structural Analysis	CE
Pool-2		
1	Concrete Technology	CE
2	Fundamentals In Foundation Engineering	CE
3	Ground Improvement Techniques	CE
4	Soil Mechanics	CE
Pool-3		
1	Environmental Impact Assessment	CE
2	Basics In Surveying	CE
3	Solid Waste Management	CE
4	Water Supply Engineering	CE
Pool-4		
1	Highway Engineering	CE
2	Transport Systems	CE
3	Green Buildings	CE
4	Traffic Engineering	CE

Pool-1

REPAIR AND REHABILITATION OF STRUCTURES

Course Learning Objectives:

The student should able to understand the concepts of

1. Various aspects of Inspection, Assessment procedure for evaluating a damaged structureimparting the planning aspects of residential buildings and public buildings.
2. Different types, causes – Effects due to climate, temperature, Sustained elevated temperature.
3. Vacuum concrete, Self-compacting concrete, Geopolymer concrete, Reactive powder concrete,
4. Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.
5. Leakage, earthquake – DEMOLITION TECHNIQUES - Engineered demolition methods

- Case studies.

Course Outcomes:

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

1. Maintenance, Repair and Rehabilitation, Facets of Maintenance
2. Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete
3. Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete
4. Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion.
5. Strengthening of Structural elements, Repair of structures distressed due to corrosion

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 SPECIAL CONCRETES

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV 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 V 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 - Case studies.

Text Books:

1. Shetty.M.S.ConcreteTechnology-Theory and Practice,S.Chandand Company, 2008.
2. Vidivelli.B Rehabilitation of Concrete Structures Standard Publishes Distribution.1st edition 2009.
3. Varghese.P.C Maintenance Repair and Rehabilitation and Minor works of building, Prentice Hall India Pvt Ltd 2014.
4. Dodge Woodson.R Concrete Structures, Protection, Repair and Rehabilitation, Butterworth- Heinemann,Elsevier,New Delhi 2012

References:

1. DovKominetzky.M.S.,-Design and Construction Failures, Galgotia, Publications Pvt.Ltd.,2001
2. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And

Rehabilitation of Concrete Structures, Allied Publishers, 2004.

3. Hand book onSeismic Retrofit of Buildings,CPWD and Indian Buildings Congress, Narosa Publishers, 2008.

4. Hand Book on Repair and Rehabilitation of RCC Buildings-Director General works CPWD ,Govt of India , New Delhi-2002

BUILDING PLANNING AND DRAWING

Course Learning Objectives:

The student should able to understand the concepts of

1. Initiating the student to different building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings and public buildings.
3. Giving training exercises on various signs and bonds and different building units.
4. Imparting the skills and methods of planning of various buildings.
5. Elevations and Cross Sections of given sloped and flat roof buildings

Course Outcomes:

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

1. Plan various buildings as per the building by-laws.
2. Distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.
3. Learn the skills of drawing building elements and plan the buildings as per requirements.

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

UNIT II: Residential Buildings Minimum standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types of residential buildings andrelationship between plan, elevation and forms and functions

UNIT III: Public Buildings Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation, Landscaping requirements.

UNIT IV: Sign Conventions And Bonds Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles.

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

UNIT V: Doors, Windows, Ventilators and Roofs Panelled door, panelled and glazed door, glazedwindows, paneled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof and buildings: drawing plans, Elevations and Cross Sections of given sloped and flat roof buildings.

Text Books:

1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh

2. Building planning and drawing by M. Chakravarthi.

3. 3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur,

References:

1. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.

2. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications, New Delhi.

3. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers, New Delhi.

BUILDING MATERIALS

Course Learning Objectives:

The student should able to understand the concepts of:

1. Initiating the student with the knowledge of basic building materials and their properties.
2. Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped and flat roofs.
3. The student is to be exposed to the various patterns of floors, walls, different types of paintsand varnishes.
4. Imparting the students with the techniques of formwork and scaffolding.
5. The students should be exposed to classification of aggregates, moisture content of theaggregate.

Course Outcomes:

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

1. The student should be able to identify different building materials and their importance inbuilding construction.
2. The student is expected to differentiate brick masonry, stone masonry construction and useof lime and cement in various constructions.
3. The student should have learnt the importance of building components and finishings.
4. The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required in building construction.

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

UNIT II Masonry Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls. Wood: Structure – Properties- Seasoning of timber-

Classification of

various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium.

UNIT III: Lime And Cement Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime. Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.

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

UNITV: Finishings Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings.

Text Books:

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

References:

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

STRUCTURAL ANALYSIS

Course Learning Objectives:

The student should able to understand the concepts of:

1. To give preliminary concepts of assessment of bending moment and shear force in Proppedcantilevers, fixed beams and continuous beams due to various loading conditions.
2. To impart concepts of Bending Moment and Shear force for beams with different boundaryand loading conditions
3. The procedure for development of slope deflection equations and to solve application tocontinuous beams with and without settlement of supports.
4. The concepts of moving loads and influence lines
5. Understand the concepts of maximum SF and BM at a given section when loads of varyingspans rolling loads of Pratt and Warren trusses.

Course Outcomes:

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

1. Distinguish between the determinate and indeterminate structures.
2. Identify the behaviour of structures due to the expected loads, including the movingloads,acting on the structure.
3. Estimate the bending moment and shear forces in beams for different fixity conditions.
4. Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.
5. Draw the influence line diagrams for various types of moving loads on beams/bridges.

Syllabus:

UNIT – I Propped Cantilevers: Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

UNIT – II Fixed Beams – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of

fixed beams including effect of sinking of support, effect of rotation of a support.

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

UNIT-IV Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

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

Text Books:

1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi
3. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers,New Delhi

References:

1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.
4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledgeware, Mumbai
5. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli, YesdeePublishing

Pool-2

CONCRETE TECHNOLOGY

Course Learning Objectives:

The student should able to understand the concepts of:

1. Concepts of Concrete production and its behaviour in various environments.
2. Learn the test procedures for the determination of properties of concrete.
3. Understand durability properties of concrete in various environments.
4. Modulus of elasticity, Dynamic modulus of elasticity , Poisson's ratio
5. Mix proportions and understand the concepts of Durability of concrete, QualityControl of concrete.

Course Outcomes:

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

1. Understand the basic concepts of concrete.
2. Realize the importance of quality of concrete.
3. Familiarize the basic ingredients of concrete and their role in the production of concreteand its behaviour in the field.
4. Test the fresh concrete properties and the hardened concrete properties.
5. Evaluate the ingredients of concrete through lab test results. Design the concrete mix bybis method.

SYLLABUS:

UNIT I : Ingredients Of Concrete Cements & Admixtures: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silicafume. Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & othermechanical properties of aggregates –

UNIT – II Fresh Concrete: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of

fresh concrete-

Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete.

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

UNIT – IV, Elasticity, Creep & Shrinkage, Modulus of elasticity, Dynamic modulus of elasticity

, Poisson's ratio, Creep of concrete, Factors influencing creep, Relation between creep & time, Nature of creep, Effects of creep – Shrinkage –types of shrinkage.

UNIT – V, Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design.

Text Books:

1. Concrete Technology, M. S. Shetty. – S. Chand & Company

2. Concrete Technology, A. R. Santha Kumar, Oxford University Press, New Delhi

References:

1. Properties of Concrete, A. M. Neville – PEARSON – 4th edition

2. Concrete Technology, M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

FUNDAMENTALS IN FOUNDATION ENGINEERING

Course Learning Objectives:

The student should able to understand the concepts of:

1. Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods
2. Factors affecting bearing capacity – Bearing capacity from in-situ tests (SPT, SCPT andplate load)
3. Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour
4. Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT andSCPT)
5. Culmann's Graphical method – Pressure on the wall due to line load

Course Outcomes:

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

1. Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT)
2. Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits
3. Minimum thickness for rigid behaviour – Applications – Compensated foundation
4. Group capacity by different methods (Feld's rule, Converse – Labarra formula and blockfailure criterion)
5. Earth pressure on retaining walls of simple configurations – Culmann's Graphical method

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9 CE8591 SyllabusFOUNDATION ENGINEERING

Scope and objectives – Methods of exploration – Auguring and boring – Wash boring and rotary drilling – Depth and spacing of bore holes – Soil samples – Representative and undisturbed – Sampling methods – Split spoon sampler, Thin wall sampler, Stationary piston sampler – Penetration tests (SPT and SCPT) – Data interpretation – Strength parameters – Bore log report and Selection of foundation.

UNIT II

SHALLOW FOUNDATION 9 CE8591 Syllabus FOUNDATION ENGINEERING

Location and depth of foundation – Codal provisions – Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Factors affecting bearing capacity

– Bearing capacity from in-situ tests (SPT, SCPT and plate load) – Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundationson granular and clay deposits – Total and differential settlement – Allowable settlements – Codal provision – Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS 9 CE8591 Syllabus FOUNDATION ENGINEERING

Types of Isolated footing, Combined footing, Mat foundation – Contact pressure and settlement distribution – Proportioning of foundations for conventional rigid behaviour – Minimum thickness for rigid behaviour – Applications – Compensated foundation – Codal provision

UNIT IV PILE FOUNDATION 9 CE8591 Syllabus FOUNDATION ENGINEERING

Types of piles and their functions – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hileys) – Capacity from insitu tests (SPT and SCPT) – Negative skin friction – Uplift capacity-Group capacity by different methods (Feld's rule, Converse – Labarra formula and block failure criterion) – Settlement of pile groups – Interpretation of pile load test (routine test only), Under reamed piles – Capacity under compression and uplift – Cohesive – expansive – non expansive – Cohesionless soils – Codal provisions.

UNIT V RETAINING WALLS 9 CE8591 Syllabus FOUNDATION ENGINEERING

Plastic equilibrium in soils – Active and passive states – Rankine's theory – Cohesionless and cohesive soil – Coulomb's wedge theory – Condition for critical failure plane – Earth

pressure on retaining walls of simple configurations – Culmann's Graphical method – Pressure on the wall due to line load – Stability analysis of retaining walls – Codal provisions.

Text Books:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age InternationalPublishers.

2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

References:

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.

2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.

3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi.

GROUND IMPROVEMENT TECHNIQUES

Course Learning Objectives:

The student should able to understand the concepts of:

1. Different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. The reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. Geotextiles and geosynthetics can be used to improve the engineering performance of soils.
4. Purpose and effects of grouting.

Course Outcomes:

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

1. Various methods of ground improvement and their suitability to different field situations.
2. The design a reinforced earth embankment and check its stability.
3. Various functions of geosynthetics and their applications in civil engineering practice.
4. The concepts and applications of grouting.

SYLLABUS:

UNIT- I In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT –II Dewatering – sumps and interceptor ditches – single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electroosmosis

UNIT- III Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT- IV Reinforce earth – principles – components of reinforced earth – design

principles ofreinforced earth walls – stability checks – soil nailing.

UNIT- V Geosynthetics – geotextiles – types – functions , properties and applications – geogrids

, geomembranes and gabions - properties and applications.

Text Books:

1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi.

2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited ,New Delhi.

Reference:

1. Ground Improvement, M.P. Moseley, Blackie Academic and Professional, USA.

2. Designing with Geosynethetics, R. M Koerner, Prentice Hall

SOIL MECHANICS

Course Learning Objectives:

The student should able to understand the concepts of:

1. Index properties of the soil and classify it.
2. Seepage of water through soils and determine the seepage discharge.
3. Differentiate between compaction and consolidation of soils and to determine the magnitude and the rate of consolidation settlement.
4. Shear strength of soils, assessment of the shear parameters of sands and clays and the areasof their application.

Course Outcomes:

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

1. The definition of the various parameters related to soil mechanics and establishes theirinter-relationships.
2. The methods of determination of the various index properties of the soils and classify thesoils.
3. The importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory.
4. The above concepts in day-to-day civil engineering practice.

SYLLABUS:

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

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

UNIT –III Permeability: Soil water – capillary rise – One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems. Total, neutral and effective

stresses –quick sand

condition – 2-D flow and Laplace's equation - Seepage through soils –Flow nets: Characteristicsand Uses.

UNIT – IV Stress Distribution In Soils: Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart

– 2:1 stress distribution method.

UNIT – V Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation

– Time rate of consolidation and degree of consolidation – Determination of coefficient ofconsolidation (cv) - Over consolidated and normally consolidated clays.

Text Books:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age InternationalPublishers.

2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

References:

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.

2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.

3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi

Pool-3

ENVIRONMENTAL IMPACT ASSESSMENT

Course Learning Objectives:

The student should able to understand the concepts of:

1. To impart knowledge on different concepts of Environmental Impact Assessment
2. To know procedures of risk assessment
3. To learn the EIA methodologies and the criterion for selection of EIA methods
4. To pre-requisites for ISO 14001 certification
5. To know the procedures for environmental clearances and audit

Course Outcomes:

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

1. Prepare EMP, EIS, and EIA report
2. Identify the risks and impacts of a project
3. Selection of an appropriate EIA methodology
4. Evaluation the EIA report
5. Estimate the cost benefit ratio of a project

SYLLABUS:

UNIT – I Basic concept of EIA: Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base map-Classification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA

UNIT – II E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis - EIS and EMP

UNIT-III Impact of Developmental Activities and Land use: Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives- application of remote sensing and GIS for EIA.

UNIT-IV Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures - E I A with reference to surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Generalized approach for assessment of Air pollution Impact.

UNIT – V Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation.

Text Books:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)

2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, SultanBazar, Hyderabad.

References:

1. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice HallPublishers

2.Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.

3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

BASICS IN SURVEYING

Course Learning Objectives:

The student should able to understand the concepts of:

1. Basic surveying skills
2. Various surveying instruments.
3. Different methods of surveying
4. Various data required for various methods of surveying.
5. Integrate the knowledge and produce topographical map.

Course Outcomes:

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

1. Definition-Uses of surveying- overview of plane surveying
2. EDM-Errors and corrections to linear measurements- Compass survey- Meridians, Azimuths and Bearings
3. Temporary and permanent adjustments-
4. method of leveling. Principles-uses and adjustments – temporary and permanent,

Syllabus:

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

UNIT – II Distances And Direction: Electronic distance measurements (EDM)- principles of electro optical EDM-Errors and corrections to linear measurements- Compass survey- Meridians,Azimuths and Bearings, declination, computation of angle.

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

UNIT – III Leveling And Contouring: Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. Characteristics and Uses of contours-methods of conducting contour surveys.

UNIT – IV Theodolite: Description, principles-uses and adjustments – temporary and

permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite – Introductionto Trigonometrical leveling,.

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

Text Books:

1. Surveying, Vol No.1, 2 &3, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – LaxmiPublications Ltd, New Delhi.

2. Advance Surveying, Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.

3. Text book of Surveying, C. Venkataramaiah, University press, India Limited.

4. Surveying and levelling, R. Subramanian, Oxford University press.

References:

1. Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd.New Delhi.

2. Text book of Surveying, Arora (Vol No. 1&2), Standard Book House, Delhi.

3. Higher Surveying, A.M. Chandra, New Age International Pvt ltd.

4. Fundamentals of surveying, S.K. Roy – PHI learning (P) ltd.

SOLID WASTE MANAGEMENT

Course Learning Objectives:

The student should able to understand the concepts of:

1. To impart the knowledge the methods of collection and optimization of collection routingof municipal solid waste
2. To acquire the principles of treatment of municipal solid waste
3. To know the impact of solid waste on the health of the living beings
4. To learn the criterion for selection of landfill and its design
5. To plan the methods of processing such as composting the municipal organic waste

Course Outcomes:

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

1. The collection systems of solid waste of a town
2. Treatment of municipal solid waste and landfill
3. The criteria for selection of landfill
4. C the solid waste and design a composting facility
5. The method of treatment and disposal of hazardous wastes.

SYLLABUS:

UNIT- I Introduction to Solid Waste Management: Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization –Future changes in waste composition, major legislation, monitoring responsibilities, Terms related to ISWM like WTE, ULB, TLV etc..Measurement of NPK and Calorific value.

UNIT- II Basic Elements in Solid Waste Management: Elements and their inter relationship – principles of solid waste management- onsite handling, storage and processing of solid waste

Collection of Solid Waste: Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

UNIT- III Transfer, Transport and Transformation of Waste: Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements. Unit operations used for separation and transformation: shredding - materialsseparation and recovery, source reduction and waste minimization

UNIT- IV Processing and Treatment: Processing of solid waste - Waste transformation through combustion and composting. Market yard wastes and warming composting and vermin composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT- V Disposal of Solid Waste: Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation. Case studies

Text Books:

1. Integrated Solid Waste Management, George Techobanoglous, McGraw Hill Publication, 1993

References:

1. Solid Waste Engineering, Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, NewDelhi, 2004

2. Hazardous Waste Management, Charles A. Wentz, McGraw Hill Publication, 1995.

3. Solid and Hazardous Waste Management PM Cherry, CBS Publishers and Distributors. NewDelhi, 2016.

4. Solid Waste Engineering, William A Worrell, P Aarue Vesilind, Cengage Learning, New Delhi2016.

WATER SUPPLY ENGINEERING

Course Learning Objectives:

The student should able to understand the concepts of:

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

Course Outcomes:

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

1. Plan and design the water and distribution networks and sewerage systems
2. Identify the water source and select proper intake structure
3. Characterization of water
4. Select the appropriate appurtenances in the water supply
5. Selection of suitable treatment flow for raw water treatments

SYLLABUS:

UNIT–I Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting.

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

Collection and Conveyance of Water: Factors governing the selection of the intake

structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, laying of pipe lines

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

UNIT–IV Treatment of Water: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration

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

Text Books

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

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

References

1.Water Supply Engineering – P. N. Modi. 2.Water Supply Engineering – B. C. Punmia

3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie

4.Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

POOL-4

HIGHWAY ENGINEERING

Course Learning Objectives:

The student should able to understand the concepts of:

1. To impart different concepts in the field of Highway Engineering.
2. To acquire design principles of Highway Geometrics and Pavements
3. To learn various highway construction and maintenance procedures
4. Road Aggregates and Bituminous Materials
5. Flexible Pavement Design Methods

Course Outcomes:

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

1. Plan highway network for a given area.
2. Determine Highway alignment and design highway geometrics
3. Design Intersections and prepare traffic management plans
4. Judge suitability of pavement materials and design flexible and rigid pavements
5. Construct and maintain highways

SYLLABUS:

UNIT I

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

UNIT – II Highway Geometric Design: Importance of Geometric Design- Design controls andCriteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-

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

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

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

UNIT – V Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors Flexible Pavements: Design factors of Rigid Pavements – Stresses in Rigid Pavements, Failures in Flexible & Rigid Pavements.

TEXT BOOKS:

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros.,Roorkee.

2. Traffic Engineering and Transportation Planning, Kadiyali L. R, Khanna Publishers, NewDelhi.

REFERENCES:

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi

2. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi

TRANSPORT SYSTEMS

Course Learning Objectives:

The student should able to understand the concepts of:

1. Development of transport, various road development plans and policies in India.
2. Railway mode of transport and its working
3. Planning, operation and maintenance of airport
4. Development of ports & their uses
5. Characteristics and operation of different urban transportation systems.

Course Outcomes:

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

1. Different transport plans and policies
2. The railway mode of transport
3. The design various component of airport
4. Characterize harbours & ports
5. Differentiate various urban transportation systems

SYLLABUS:

UNIT I:

Historical development of transport in India - Road Development Plans, National Transport Policy Recommendations, Vision 2021, NHDP, PMGSY - IRC, CRRI. Characteristics of different modesof transport and their integration and interactions - impact on environment.

UNIT II:

Planning of railway - Passenger and goods terminals - layout - passenger facilities – traffic control.

UNIT III:

Airport Planning, requirements and components. Design of runway and taxiway - Apron - parking configuration - terminal requirements - Airport marking and lighting - Air traffic control.

UNIT IV:

Planning of Harbours and ports – Harbour infrastructures - Port facilities - Containerization -Navigation aids - Inland waterways - Pipeline transportation.

UNIT V:

Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapid transit, guided way systems, cabin taxi, dual mode bus - Para transit systems – Demand responsive system
- Intermediate public transport.

Text Book:

1. Paquette, R.J., et al, Transportation Engineering Planning and Design, John Wiley & Sons, NewYork

2. Horenjeff Robert; the planning & Design of Airports, McGraw Hill Book Co., 2007

References:

1. Alan Black, Urban Mass Transportation Planning, McGraw-Hill

GREEN BUILDINGS

Course Learning Objectives:

The student should able to understand the concepts of:

1. Green buildings and sustainable development, typical features of green buildings
2. Soil erosion control, minimizing urban heat island effect
3. Methods to reduce operational energy: energy efficient building envelopes
4. Use of natural and renewable materials like bamboo, timber, rammed earth
5. Day lighting, air ventilation, exhaust systems, low voc paints, materials

Course Outcomes:

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

1. GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.
2. Water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.
3. Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy
4. Waste Management: Handling of construction waste materials, separation of householdwaste, on-site and off-site organic waste management
5. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc.

UNIT-I

Introduction to Green Buildings: Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT- II

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building

facades, day lighting, ventilation, etc. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, waterefficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT-III

Energy Efficiency: Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioning systems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT-IV

Building materials: Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste.

UNIT-V

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Daylighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc.

TEXTBOOK:

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, IndianGreenBuilding Council Publishers.

2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.

TRAFFIC ENGINEERING

Course Learning Objectives:

The student should able to understand the concepts of:

1. To understand basics principles of traffic engineering
2. To understand the causes of accident
3. To evaluate the traffic capacity
4. To design the optimal signal time
5. To propose desired measures to reduce traffic congestions

Course Outcomes:

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

1. The basics principles of Traffic Engineering
2. Analyzing parking data and model accidents
3. Determining capacity and LOS.
4. Evolution & design the optimal signal time
5. The engineering techniques to achieve Safe and efficient movement of people

SYLLABUS

UNIT - I

Traffic Studies: Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Statistical Methods for speed data Analysis, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance.

UNIT - II

Traffic Studies: Origin and Destination Studies. Parking Studies: parameters of parking, definitions, Parking inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Accident studies- Causative factors of Road accidents, Accident data collection: Accident analysis and modeling;, Road Safety Auditing, Measures to increase Road safety.

UNIT - III

Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS, Capacity of Urban/Rural Highway, with or without access control, Basic freeway segments - Service flow rate of LOS.

UNIT - IV

Signal Designing – Fixed Time signals, Determination of Optimum Cycle length and Signal settingfor Fixed Time signals, Vehicle Actuated Signals, Signal Coordination.

UNIT - V

Transportation System Management - Measures for improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible Lanes-Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

TEXT BOOK:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers

2. Traffic Engineering – Khanna & Justo.

REFERENCES:

1. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice HallPublication.

2. Traffic Engineering by Roger P. Roess, William R. Mc. Shane, Elena S. Prassas ,

Prentice Hall.