VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE AND SYLLABUS

for

B. Tech Civil Engineering

(Applicable for batches admitted from 2020-2021)

VVIT

VASIREDDY VENKATADRI
INSTITUTE OF TECHNOLOGY

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

(Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUK,

NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

About Institute

VasireddyVenkatadri Institute of Technology (VVIT) was established in the year 2007, with an intake of 240 students in four B. Tech programs under Social Educational Trust in Nambur village, Guntur, AP, by Er. VasireddyVidyaSagar. It is located strategically between Guntur and Vijayawada in the capital region of Amravati, AP. In a short span of ten years, with an annual intake capacity of 1260 and 81 students into B.Tech (CE, EEE, ME, ECE, CSE, IT, CSM, CSO, CIC and AID) and M. Tech (CSE, VLSI&ES, PEED, MD, SE) programs respectively, today almost 4000 students, 345 teaching staff and 225 non-teaching staff strive to fulfill the vision of VVIT.

VVIT has emerged as one of the top ten Engineering Colleges from the 200 engineering colleges affiliated to JNTU Kakinada. The Institute signedMoUs with Industry and Training & Placement Companies like Infosys, Tech Mahindra, Social Agro, Efftronics, AMCAT and Cocubes. Centre of Excellence (CoE) by Siemens India was established in the year 2016 by APSSDCto promote Industry Institute interface and strengthen employability skills in students, Google Inc. USA for establishing Google Code labs, University Innovative Fellowship (UIF) program by Stanford University USA and VDC established by Northeastern University

On achieving permanent affiliation to JNTUK, Kakinada, NAAC 'A" grade certification (CGPA 3.09) and B. Tech programs (CE, EEE, ME, ECE, CSE, IT) accredited by NBA, VVIT has set its sight on centrally funded research projects with 10 completed and 6 running DST projects and consultancy service from other departments. VVIT as part of its commitment to research, has published 13 patents, 16 books and nearly 690 journal papers and also has a 'Research Centre affiliated to JNTUK'.

Institute Vision

To impart quality education through exploration and experimentation and generate socially conscious engineers, embedding ethics and values, for the advancement in science and technology.

Institute Mission

- To educate students with a practical approach to dovetail them to industry-needs.
- To govern the institution with a proactive and professional management with passionate teaching faculty.
- To provide holistic and integrated education and achieve over all development of students by imparting scientific and technical, social and cognitive, managerial and organizational skills.
- To compete with the best and be the most preferred institution of the studious and the scholarly.
- To forge strong relationships and linkage with the industry.

Department Vision

To provide globally competitive and socially responsible Civil Engineering professionals, who can contribute to the organization and nation-building through their innovative ideas and to create knowledge pool of Civil Engineering through quality research.

Department Mission

- To develop and implement qualitative teaching and learning practices to impart quality education to the students to dovetail them to industry needs
- To develop engineers with good scientific and engineering knowledge so as to comprehend, analyze, design and apply knowledge to the fast changing needs in the field of Civil Engineering.
- To provide hands-on experience and knowledge to the students to make them engineers of excellence.
- To promote innovative and original thinking in the minds of budding engineers to face the Challenges of future by shaping the department into a center of academic and research excellence.
- To inculcate the value of discipline and encourage the student to become a responsible and worthy citizen of the nation.

Program Educational Objectives (PEOs)

PEO 1 : To produce the students who can excel in their professional career and/or in higher education by acquiring knowledge in mathematical, computing and engineering principles.

PEO 2 : To produce the students who can analyze any real life problem and design structures which are not only safe, eco-friendly and economical but also socially acceptable.

PEO 3 : To train the students to exhibit the ethical professionalism by imbibing right attitude and built teamwork.

PEO 4 : To produce the students who excel as an entrepreneur by adapting lifelong learning practices and facing the challenges with acquired knowledge through research and development and innovative thinking.

Program Outcomes (POs)

PO1 : Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 : Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 : Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 : Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 : Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 : The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 : Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 : Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 : Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 : Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 : Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1 : Graduates will be able to adapt creative thinking and problem-solving approach in planning, analysis, design and estimation of civil engineering structures and services.

PSO2 : Able to act as renowned consultant in all divisions of civil engineering for providing sustainable solutions to practical problems.

PSO3 : Graduates will be able to acquire updated knowledge to provide cost-effective solutions to societal engineering problems

ACADEMIC REGULATIONS (R20) FOR B. TECH (REGULAR)

Applicable for the students of B.Tech from the Academic Year 2020 – 21 onwards

1. Award of B. Tech. Degree

A student will be declared eligible for the award of B. Tech. degree if he/she fulfills the following:

- Pursues a course of study in not less than four and not more than eight academic years.
- After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.
- Registers for 160 credits and must secure all the 160 credits.
- A student shall be eligible for the award of **B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.**

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

S. No.	Branch	Branch Short Form	Branch Code
1	Civil Engineering	CIV	01
2	Electrical and Electronics Engineering	EEE	02
3	Mechanical Engineering	MEC	03
4	Electronics and Communication Engineering	ECE	04
5	Computer Science and Engineering	CSE	05
6	Information Technology	INF	12
7	CSE (Artificial Intelligence and Machine Learning)	CSM	42
8	CSE (Internet of Things and Cyber Security with Block Chain Technology)	CIC	47
9	CSE (Internet of Things)	CSO	49
10	Artificial Intelligence and Data Science	AID	54

3. 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.

4. **Admissions:** Admission to the B. Tech Programme 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 on the basis of the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or on the basis of 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.

5. **Structure of the Undergraduate Engineering program:** Every course of B. Tech. Program shall be placed in one of the nine categories as listed in table below:

S.No.	Category	Breakup of Credits
1	Humanities and social science including Management courses	10.5 - 12
2	Basic Science courses	21 - 25
3	Engineering science courses	24
4	Professional core Courses	48 - 51
5	Open Elective Courses	12 - 18
6	Professional Elective Courses	15 - 18
7	Internship, seminar, project wok	15 – 16.5
8	Mandatory courses	NC
9	Skill Oriented Courses	----
	Total Credits	160

****** Breakup of Credits based on AICTE /APSCHE

Assigning of Credits

- Hr. Lecture (L) per week - 1 credit
- Hr. Tutorial (T) per week - 1 credit
- Hr. Practical (P) per week - 0.5 credits

6. **Programme Pattern**

i. Total duration of the of B. Tech (Regular) Programme is four (three for lateral entry) academic years

ii. Each Academic year of study is divided in to two semesters.

iii. Minimum number of instruction days in each semester is 90.

iv. Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

v. The total credits for the Programme are 160.

vi. A three-week induction program is mandatory for all first year UG students (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc.,) and shall be conducted as per AICTE/UGC/APSCHE guidelines.

vii. Student is introduced to "Choice Based Credit System (CBCS)".

viii. A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses: two basic level skill courses, one on soft skills and other two on advanced level skill courses)

ix. A student has to register for all courses in a semester.

x. All the registered credits will be considered for the calculation of final CGPA.

xi. Each semester has - Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

xii. A 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester to acquire the skills required for job and make engineering graduates to connect with the needs of the industry and society at large.

xiii. All students shall be mandatorily registered for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

xiv. Courses like Environmental Sciences, Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

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

xvi. Departments may swap some of the courses between first and second semesters to balance the work load.

xvii. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.

8. Registration for Courses

i. The college shall invite registration forms from the students at the beginning of the semester for the registration for courses each semester. The registration process shall be closed within one week. If any student wishes to withdraw the registration, he/she shall submit a letter to the principal through the class teacher/instructor and HOD. The principal shall communicate the registration and withdraw details courses of each student in a consolidated form to the college examination section and University without fail.

ii. There are four open electives in each branch. All Open Electives are offered to students of all branches in general. A student shall choose an open elective, by consulting the HOD/advisor, from the list in such a manner that he/she has not studied the same course in any form during the Programme. The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

iii. A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the programme. Students are advised to register for only for minimum 12 weeks in duration MOOCs courses. Student has to pursue and acquire a certificate for a MOOC course only from the SWAY/NPTE through online with the approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester. The details of the MOOCs courses registered by the students shall be submitted to the University examination center as well as college examination center. The Head of the Department shall appoint a mentor for each of the MOOC subjects registered by the students to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

iv. Two summer internships each with a minimum of six weeks duration shall be mandatorily done/completed respectively at the end of second and third years (during summer vacations). The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. After completing the summer internship, the students shall register in the immediate respective odd semester and it will be evaluated at the end of the semester as per norms of the autonomy. The student has to produce the summer internship satisfactory report and certificate taken from the organization to be considered for evaluation. 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.

v. In the final semester, the student should mandatorily register and undergo internship 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.

vi. Curricular Framework for Skill oriented courses

a. There are five (05) skill-oriented courses shall be offered during III to VII semesters and students must register and pass the courses successfully.

b. For skill oriented/skill advanced course, one theory and 2 practical hours (1-0-2) or two theory hours (2-0-0) may be allotted as per the decision of concerned BOS.

c. Out of the five skill courses; (i) two shall be skill-oriented courses from the same domain and shall be completed in second year (ii) Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining two shall be skill-advanced courses either from the same domain or job-oriented skill courses, which can be of inter disciplinary nature.

d. Students may register the interdisciplinary job-oriented skill courses based on the prerequisites and eligibility in consultation with HoD of the college.

e. 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/APSSDC or any other accredited bodies. However, the department has to assign mentors in the college to monitor the performance of the students.

f. If a student chooses to take a certificate course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the department, then the department shall mark overall 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. However, the student is deemed to have fulfilled the attendance requirement of the course, if the external agency issues a certificate with satisfactory condition. If the certificate issued by external agency is marked with unsatisfactory condition, then the student shall repeat the course either in the college or at external agency. The credits will be awarded to the student upon producing the successful course completion certificate from the agency/professional bodies and after passing in the viva-voce examination conducted at college as per BoS norms at the end of the semester.

9. Attendance Requirements:

i. A student is eligible to write the semester-end examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.

ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

iii. Condonation for 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.

iv. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.

v. A student will be promoted to the next semester if he satisfies the(a) attendance requirement of the present semester and (b) minimum required credits (from V^{th} Semester onwards).

vi. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

vii. For induction programme attendance shall be maintained as per AICTE norms.

viii. For non-credit mandatory courses the students shall maintain the attendance similar to credit courses.

10. Evaluation-Distribution and Weightage of marks

Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council of the institute from time to time.

i. A student is deemed to have satisfied the minimum academic requirements if he/she has earned the credits allotted to each theory/practical design/drawing subject/ project etc. by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the total of the internal marks and end semester examination marks together.

ii. For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

iii. **Distribution and Weightage of marks:** The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory subject, 50 marks for practical subject/Mini Project/Internship/Industrial Training/ Skill Development programmes/Research Project, and 200 marks for end Project Work.

iv. Guide lines for Continuous Internal Evaluation (CIE)

a. For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination (ii) one descriptive examination (iii) one assignment and (iv) one Subject Seminar. The online examination (objective) shall be 10 marks with duration of 20 minutes, descriptive examination shall be for 10 marks with a duration of 1 hour 30 minutes, assignment test

shall be 5 marks with duration of 50 minutes (Open book system with questions of L4 standard on Bloom's scale) and 90 minutes for descriptive paper) and Subject Seminar 5 marks.

b. The first online examination (objective) is set with 20 multiple choice questions for 10 marks (20 questions x 1/2 marks) from first two and half units (50% of the syllabus).

c. The descriptive examination is set with 3 full questions for 10 marks each from first two and half units (50% of the syllabus), the student has to answer all questions.

d. The Assignment Test from first two and half units conducted for 20 Marks and will be scaled down to 5 Marks. The test is open book system and the duration of the exam is 50 minutes. Students can bring a maximum of three printed text books related to that subject. (Soft copies of the text books will not be allowed.) The assignments have to provide broadened exposure to the course. The questions shall include problem solving approach, problem analysis & design, implementation, case studies etc.

e. For the subject seminar 5 marks, each student shall be evaluated based on the presentation on any topic of his/her choice in the subject duly approved by the faculty member concerned.

f. For the subject having design and / or drawing ((such as Engineering Graphics / Drawing, Design & Drawing of Reinforced Concrete Structures, Design & Drawing of Steel Structures and Advanced Design of Steel Structures) the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests).

In the similar lines, the mid-2 examinations shall be conducted on the rest of the syllabus.

f. For practical subjects there shall be continuous evaluation during the semester for 25 marks. The internal 25 marks shall be awarded as follows: day to day work 5 marks, record 5 marks and the remaining 15 marks are to be awarded by conducting an internal laboratory test of 3 hours duration.

g. The mid marks submitted to the examination section shall be displayed in the concerned department notice boards for the benefit of the students. If any discrepancy found in the displayed Mid marks, it shall be brought to the notice of examination section within two working days from the date of display.

h. Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for another mid exam.

Example:

Mid-1 marks = Marks secured in (online examination-1+descriptive examination-1 +one assignment-1 + Seminar-1)

Mid-2 marks = Marks secured in (online examination-2+descriptive examination-2 +one assignment-2 + Seminar-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

v. Semester End Examinations Evaluation:

a. The semester end examinations for theory subjects will be conducted autonomous examination section for 70 marks consists of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

b. For practical subjects shall be conducted for 35 marks by the teacher concerned and external examiner appointed by Chief superintendent/ Controller of Examinations (CoE), VVIT. All the laboratory records and internal test papers shall be preserved in respective departments as per autonomous norms and shall be produced to the Committees as and when they ask for.

c. Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the academic regulations. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner appointed by Chief superintendent/ CoE; Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. 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 examination section.

d. The job-oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external (appointed by the Chief superintendent/ CoE) and internal examiner (course instructor or mentor). There are no internal marks for the job-oriented skill courses.

e. Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc. non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the department internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

f. Procedure for Conduct and Evaluation of MOOC: There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL/etc., through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

g. Major Project (Project - Project work, seminar and internship in industry): In the final semester, the student should mandatorily register and undergo internship 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. Evaluation: 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 Chief superintendent/ CoE and is evaluated for 140 marks.

vi. Recounting/ Revaluation/ Revaluation by Challenge in the End Semester Examination: A student can request for recounting/ revaluation/ revaluation by challenge of his/her answer book on payment of a prescribed fee as per autonomous norms.

vii. Supplementary Examinations: A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the examination section.

viii. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Mid/End examinations as per the rules framed by the academic council.

ix. If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

11. Promotion Rules:

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

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

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

12. Course Pattern

i. The entire course of study is for four academic years; all years are on semester pattern.

ii. A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.

iii. When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

13. Grading:

The grade points and letter grade will be awarded to each course based on students' performance as per the grading system shown in the following Table.

% of Marks	Letter Grade	Level	Grade Points
≥ 90	**A+**	Outstanding	10
80 to 89	**A**	Excellent	9
70 to 79	**B**	Very Good	8
60 to 69	**C**	Good	7
50 to 59	**D**	Fair	6
40 to 49	**E**	Satisfactory	5
<40	**F**	Fail	0
ABSENT	**Ab**	Absent	0

14. Computation of SGPA and CGPA

i. 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.

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

where, C_i is the number of credits of the ith subject and G_i is the grade point scored by the student in the ith course

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

$CGPA = \Sigma (C_i \times Si) / \Sigma Ci$

where 'S_i' is the SGPA of the ith semester and C_i is the total number of credits in that semester

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

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

v. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

vi. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.

vii. As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

Equivalent Percentage = (CGPA – 0.75) x 10

viii. Illustration of Computation of SGPA and CGPA

Illustration for SGPA: Let us assume there are 6 subjects in a semester. The grades obtained as follows:

Course	Credit	Grade Obtained	Grade point	Credit x Grade Point
Subject 1	3	B	8	3 X 8 = 24
Subject 2	4	C	7	4 X 7 = 28
Subject 3	3	D	6	3 X 6 = 18
Subject 4	3	A^+	10	3 X 10 = 30
Subject 5	3	E	5	3 X 5 = 15
Subject 6	4	D	6	4 X 6 = 24
	20			139

Thus, SGPA (S_i) =139/20 =6.95=6.9 (approx.)

Illustration for CGPA:

	Sem-1	**Sem-2**	**Sem-3**	**Sem-4**	**Sem-5**	**Sem-6**	**Sem-7**	**Sem-8**
Credits	20	22	25	26	26	25	21	23
SGPA	6.9	7.8	5.6	6.0	6.3	8.0	6.4	7.5

$$\boldsymbol{CGPA} = \frac{\mathbf{20\,X6.9 + 22X7.8 + 25X5.6 + 26X6.0 + 26X6.3 + 25X8.0 + 21X6.4 + 23X7.5}}{\mathbf{188}}$$

$$= \frac{\mathbf{1276.3}}{\mathbf{188}} = \mathbf{6.78}$$

15. 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:

Class Awarded	CGPA to be secured
First Class with distinction*	≥7.5
First Class	≥6.5 &<7.5
Second Class	≥5.5 &<6.5
Pass Class	≥4 &<5.5
Fail	<4

* Awarded only if all the credit courses prescribed are cleared within four years for regular candidates and three years for lateral entry candidates

The students who are approved for break in study for entrepreneurships / startups will also be considered for award of first class with distinction

For the purpose of awarding First, Second and Pass Class, CGPA obtained in the examinations appeared within the maximum period allowed for the completion of the program shall been considered

16. Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at university level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

17. Transitory Regulations

A candidate, who is detained or discontinued a semester, on re-admission shall be required to pass all the courses in the curriculum prescribed for such batch of students in which the student joins subsequently and the academic regulations be applicable to him/her which are in force at the time of his/her admission. However, exemption will be given to those candidates who have already passed in such courses in the earlier semester(s) and additional courses are to be studied as approved by Board of Studies and ratified by Academic Council.

18. Curricular Framework for Honors Programme

i. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

ii. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

iii. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

iv. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e., 160 credits).

v. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

vi. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

vii. The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

viii. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

ix. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

x. The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a

student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

xi. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xii. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

19. Curricular Framework for Minor Programme

i. Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

ii. Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

iii. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc., or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

iv. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

v. There shall be no limit on the number of programs offered under Minor. The college can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

vi. The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

vii. A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA up to 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

viii. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e., 160 credits).

ix. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

x. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the University/academic council.

xi. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

xii. A committee should be formed at the level of College / department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

xiii. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript or None of the courses done under the dropped Minor will be shown in the transcript.

xiv. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xv. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

20. Industrial Collaborations (Case Study)

Institution-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Universities in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Institutions are permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Institutions can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Institutions shall also explore the possibilities of collaborations with major industries in the core sectors and professional bodies to create specialized domain skills.

21. Amendments to Regulations: The college may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Board of Studies with the approval of Academic Council and Governing Body of the college.

22. Transferred Students: The students seeking transfer to VVIT from various Universities/ Institutions have to obtain the credits of any equivalent subjects as prescribed by the Academic Council. Only the internal marks obtained in the previous institution will be considered for evaluation of failed subjects.

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ACADEMIC REGULATIONS (R20) FOR B. TECH.

(LATERAL ENTRY SCHEME)

Applicable for the students admitted into II-year B. Tech. from the Academic Year 2021-22 onwards

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

- A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years.
- The candidate shall register for 121 credits and secure all the 121 credits.
- A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 121 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

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

3. Promotion Rule

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

4. Award of Class

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

Class Awarded	CGPA to be secured
First Class with distinction*	≥7.5
First Class	≥6.5 &<7.5
Second Class	≥5.5 &<6.5
Pass Class	≥4 &<5.5
Fail	<4

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

COMMUNITY SERVICE PROJECT

Introduction

1. Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
2. Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
3. Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

1. To sensitize the students to the living conditions of the people who are around them,
2. To help students to realize the stark realities of the society.
3. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
6. To help students to initiate developmental activities in the community in coordination with public and government authorities.
7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

1. Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation.
2. Each class/section should be assigned with a mentor.
3. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
4. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
5. The log book has to be countersigned by the concerned mentor/faculty in charge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conducted

by a committee constituted by the principal of the college.
10. Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

1. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening orso.
2. The Community Service Project is a twofold one –

a) First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.

b) Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –

- Agriculture
- Health
- Marketing and Cooperation
- Animal Husbandry
- Horticulture
- Fisheries
- Sericulture
- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy
- Internet
- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

1. Positive impact on students' academic learning
2. Improves students' ability to apply what they have learned in "the real world"
3. Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
4. Improved ability to understand complexity and ambiguity

Personal Outcomes

1. Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
2. Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

1. Reduced stereotypes and greater inter-cultural understanding

2. Improved social responsibility and citizenship skills
3. Greater involvement in community service after graduation

Career Development

1. Connections with professionals and community members for learning and career opportunities
2. Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

1. Stronger relationships with faculty
2. Greater satisfaction with college
3. Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

1. Satisfaction with the quality of student learning
2. New avenues for research and publication via new relationships between faculty and community
3. Providing networking opportunities with engaged faculty in other disciplines or institutions
4. A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

1. Improved institutional commitment
2. Improved student retention
3. Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

1. Satisfaction with student participation
2. Valuable human resources needed to achieve community goals
3. New energy, enthusiasm and perspectives applied to community work
4. Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture

11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence

4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharat
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –

i. Agriculture
ii. Health
iii. Marketing and Cooperation
iv. Animal Husbandry
v. Horticulture
vi. Fisheries
vii. Sericulture
viii. Revenue and Survey
ix. Natural Disaster Management
x. Irrigation
xi. Law & Order
xii. Excise and Prohibition
xiii. Mines and Geology
xiv. Energy

Role of Students:

1. Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.

2. For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
3. As and when required the College faculty themselves act as Resource Persons.
4. Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
5. And also, with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
6. An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. Preliminary Survey (One Week)

a) A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.

b) A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.

c) The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (Two Weeks)

Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Four Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

MALPRACTICE RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No.	Nature of Malpractices/Improper conduct	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical

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

	representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

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

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

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

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

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

ABSOLUTELY NO TO RAGGING

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

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

COURSE STRUCTURE

Definition of Credit (C)

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit

Structure of B. Tech program Regulation R20

S.No.	Category	Code	Suggested Breakup of Credits by AICTE	Suggested Breakup of Credits by APSCHE	Breakup of Credits
1	Humanities and Social Sciences including Management courses	HS	12	10.5	10.5
2	Basic Science courses	BS	25	21	18
3	Engineering Science courses including workshop, drawing, basics of electrical/ mechanical/ computer etc	ES	24	24	24
4	Professional core courses	PC	48	51	57
5	Professional Elective courses relevant to chosen specialization/ branch	PE	18	15	15
6	Open subjects – Electives from other technical and /or emerging subjects	OE	18	12	12
7	Project work, seminar and internship in industry or elsewhere	PR	15	16.5	13.5
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	MC	Non-Credit	Non-Credit	Non-Credit
9	Skill Oriented Courses	SC	--	10	10
Total			**160**	**160**	**160**

SEMESTER-WISE STRUCTURE OF CURRICULUM

Course structure for eight semesters during four years of study is as follows

I Year I Semester (Semester-1)

S.No.	Course Code	Course Name	L	T	P	C
1	20SH1T02	Communicative English	3	0	0	3
2	20SH1T01	Mathematics-I	2	1	0	3
3	20SH1T03	Engineering Physics	2	1	0	3
4	20ME1L01	Engineering Graphics	1	0	4	3
5	20CS1T01	Problem Solving using C	2	1	0	3
6	20SH1L01	Communicative English Lab	0	0	3	1.5
7	20SH1L03	Engineering Physics Lab	0	0	3	1.5
8	20CS1L01	Problem Solving using C Lab	0	0	3	1.5
					Total Credits	**19.5**

Category		Credits
BS	Basic Science Courses	3+3+1.5=7.5
ES	Engineering Science Courses	3+3+1.5=7.5
HS	Humanities and Social Sciences including Management courses	3+1.5=4.5
	Total Credits	**19.5**

I Year II Semester (Semester-2)

S.No.	Course Code	Course Name	L	T	P	C
1	20SH2T01	Mathematics – II	2	1	0	3
2	20SH2T05	Engineering Chemistry	2	1	0	3
3	20EE2T02	Basic Electrical & Electronics Engineering	3	0	0	3
4	20CE2T01	Building Materials and Construction	3	0	0	3
5	20ME2T02	Engineering Mechanics	2	1	0	3
6	20SH2L05	Engineering Chemistry Lab	0	0	3	1.5
7	20CE2L01	Civil Workshop Practice Lab	0	0	3	1.5
8	20EE2L02	Basic Electrical & Electronics Lab	0	0	3	1.5
9	20SH2N01	Indian Constitution	2	0	0	0
					Total	**19.5**

Category		Credits
BS	Basic Science Courses	3+3+1.5=7.5
ES	Engineering Science Courses	3+3+3+1.5+1.5=12
	Total Credits	**19.5**

II Year I Semester (Semester-3)

S.No.	Course Code	Course Name	L	T	P	C
1	20SH3T01	Mathematics-III	2	1	0	3
2	20CE3T01	Strength of Materials	2	1	0	3
3	20CE3T02	Fluid Mechanics	2	1	0	3
4	20CE3T03	Surveying	2	1	0	3
5	20CE3T04	Concrete Technology	3	0	0	3
6	20CE3L01	Strength of Material Laboratory	0	0	3	1.5
7	20CE3L02	Surveying Field Work	0	0	3	1.5
8	20CE3L03	Concrete Technology Laboratory	0	0	3	1.5
9	20CE3C01	Skill Oriented Course 1	0	0	4	2
10	20SH3N01	Essence of Indian Knowledge and Tradition	2	0	0	0
					Total	**21.5**

Category		Credits
BS	Basic Science Courses	3
PC	Professional core courses	3+3+3+3+1.5+1.5+1.5=16.5
SOC	Skill Oriented Course	2
	Total Credits	**21.5**

II Year II Semester (Semester-4)

S.No.	Course Code	Course Name	L	T	P	C
1	20CS4T04	Scientific Computing Using Python	2	1	0	3
2	20CE4T01	Transportation Engineering	2	1	0	3
3	20CE4T02	Structural Analysis	2	1	0	3
4	20CE4T03	Hydraulics & Hydraulic Machinery	2	1	0	3
5	20CE4T04	Environmental Engineering	2	1	0	3
6	20CS4L04	Scientific Computing Using Python Laboratory	0	0	3	1.5
7	20CE4L01	Building Planning and Drawing Laboratory	0	0	3	1.5
8	20CE4L02	FM & HM Lab	0	0	3	1.5
9	20CE4C01	Skill Oriented Course 2	0	0	4	2
					Total	**21.5**
		Internship/Community Service Project 2 Months (Mandatory) during summer vacation				
		Honors/Minor courses	3	1	0	4

Category		Credits
ES	Engineering Science Courses	3+1.5=4.5
PC	Professional core courses	3+3+3+3+3+1.5+1.5=15
SOC	Skill Oriented Course	2
	Total Credits	**21.5**

III Year I Semester (Semester-5)

S.No.	Course Code	Course Name	L	T	P	C
1	20SH5T01	Engineering Economics And Management	3	0	0	3
2	20CE5T01	Soil Mechanics	2	1	0	3
3	20CE5T02	Design and Drawing of Concrete Structures	2	1	0	3
4	20IT5O02	Open Elective-I	3	0	0	3
5	20CE5P01	Professional Elective-I	3	0	0	3
6	20CE5L01	Environmental Engineering Laboratory	0	0	3	1.5
7	20CE5L02	Transportation Engineering Laboratory	0	0	3	1.5
8	20CE5L03	Engineering Geology Laboratory	0	0	3	1.5
9	20CE5E01	Skill Advanced Course 1	1	0	2	2
10	20SH5N01	Environmental Science	2	0	0	0
11	20CE5R01	Summer Internship 2 Months (Mandatory) after Second Year (to be evaluated during V semester)	0	0	3	1.5
					Total	**23**
		Honors/Minor courses	3	1	0	4

Category		Credits
HS	Humanities and Social Science Courses	3
PC	Professional Core Courses	3+3+1.5+1.5+1.5=10.5
PE	Professional Elective Courses	3
OE	Open Elective Courses/Job Oriented Elective Courses	3
SAC	Skill Advanced Course/Soft Skills Course	2
PR	Summer Internship	1.5
MC	Mandatory course (AICTE)	0
	Total Credits	**23**

III Year II Semester (Semester-6)

S.No.	Course Code	Course Name	L	T	P	C
1	20SH6T01	Universal Human Values	3	0	0	3
2	20CE6T01	Design and Drawing of Steel Structures	2	1	0	3
3	20CE6P01	Professional Elective-II	3	0	0	3
4	20CE6P02	Professional Elective-III	3	0	0	3
5	20CS6O01	Open Elective-II	3	0	0	3
6	20CE6L01	STAAD Laboratory	0	0	3	1.5
7	20CE6L02	Geotechnical Engineering Laboratory	0	0	3	1.5
8	20CE6E01	Skill Advanced Course 2	1	0	2	2
9	20SH6N01	Entrepreneurial Skills Development	2	0	0	0
					Total	**20**
		Industrial/Research Internship 2 Months (Mandatory) during summer vacation				
		Honors/Minor courses	3	0	2	4

Category		Credits
HS	Humanities and Social Science Courses	3
PC	Professional Core Courses	3+3+1.5+1.5=9
PE	Professional Elective Courses	3
OE	Open Elective Courses/Job Oriented Elective Courses	3
SAC	Skill Advanced Course/Soft Skills Course	2
	Total Credits	**20**

IV Year I Semester (Semester-7)

S.No.	Course Code	Course Name	L	T	P	C
1	PC4101	Estimation Specification and Contracts	2	1	0	3
2	PC4102	Water Resources Engineering	2	1	0	3
3	PE4102	Professional Elective-IV	3	0	0	3
4	PE4103	Professional Elective-V	3	0	0	3
5	OE4101	Open Elective- III	3	0	0	3
6	OE4102	Open Elective- IV	3	0	0	3
7	SAC4101	Skill Advanced Course 3	1	0	2	2
8	PR	Industrial / Research Internship 2 Months (Mandatory) after Third Year (to be evaluated during VII semester)	0	0	6	3
					Total	**23**
		Honors/Minor courses	3	0	2	4

Category		Credits
PC	Professional Core Courses	3
PE	Professional Elective Courses	3+3+3=9
OE	Open Elective Courses/Job Oriented Elective Courses	3+3=6
SAC	Skill Advanced Course/Soft Skills Course	2
PR	Summer Internship	3
	Total Credits	**23**

IV Year II Semester (Semester-8)

S. No	Subject code	Course Name	L	T	P	C
1	PROJ4201	Major Project Project work, seminar, and internship in industry Internship (6 months)	0	0	0	8
2	PROJ4202	Community Service Project	0	0	0	4
					Total Credits	**12**

*CSP (Community Service Project) is evaluated in the Final Year and 4 credits will be awarded by splitting the credits from the IV Year- II Semester major project as per the Proceedings No. JNTUK/DAP/CSP/Distribution of Credits/2022 dated on 24-09-2022.

Skill oriented course/Skill advanced courses

Subject code	Track-1 (Softwares)	Track-2 (Advanced Technologies)	Track-3 (Field Applications)
20CE3C01	Advanced AutoCAD	Smart Contracts	Water & Waste Water Treatment Plant
20CE4C01	Digital Land Surveying Laboratory	Machine Learning Applications in Civil Engineering	Foundation Design using Admixtures in Low bearing capacity Soils
20CE5E01	Soft skills	Soft skills	Soft skills
20CE6E01	Revit Architecture and Energy Analysis/Open Roads	ARVR Applications in Civil Engineering	Analysis & Assessment of New Building Materials Adoption
SAC4101	Bentley Pro-Structures/E-Tabs/IIT Pave/Tekla	BIM	Health Monitoring of Structures

List of Open Elective Courses Offered

Building Services
Disaster Management
Elements of Civil Engineering
Geo – Spatial Technologies
Green Buildings
Environmental Pollution and Control
Safety Engineering

Professional Elective Courses

Professional Elective- I	Professional Elective- II	Professional Elective- III	Professional Elective- IV	Professional Elective- V
Advanced Strength of Materials	Earth Retaining Structures	Foundation Engineering	Prestressed Concrete Structures	Advanced Design of Steel Structures
Reinforced Soil Structures	Earthquake Resistant Design of Structures	Bridge Engineering	Special Geotechnical Construction	Ground Improvement Techniques
Air pollution and control	Industrial Waste and Waste water Engineering	Environmental and Industrial Hygiene	Solid Waste Management	Environmental Impact Assessment
Airport Planning and Design	Road Safety Engineering	Intelligent Transportation Systems	Pavement Analysis and Design	Transportation Economics
Water Shed Management	Ground Water Development and Management	Swayam/ NPTEL / MOOCS Courses (12 Weeks Duration)	Urban Hydrology	Irrigation and Hydraulic Structures

Courses for Honors degree

Pool-I (Structural Engineering)	Pool-II (Transportation Engineering)	Pool-III (Geotechnical Engineering)	Pool-IV (Environmental Engineering)
Advanced Concrete Technology	Advanced Traffic Engineering	Advanced Soil Mechanics	Advanced Water Supply Systems
Matrix Methods of Structural Analysis	Pavement Construction, Maintenance and Management	Soil Foundation Interaction	Environment and Ecology
Advanced Reinforced Concrete Design	Transport System and Management	Rock Mechanics	Ground Water Contamination & Remediation
Design of Prestressed Concrete Strucutres	GIS Applications In Transportation Engineering	Construction in Expansive Soils	Water Quality Modelling
MOOC-1*(NPTEL/SWAYAM)Duration: 12 Weeksminimum			
MOOC-2*(NPTEL/SWAYAM)Duration: 12 Weeksminimum			

*Course/subject titlecan't be repeated

Note:

1. **Students has to acquire 16 credits with minimum one subject from each pool**
2. **Compulsory MOOC/NPTEL course for 4 credits (2 course, each 2 credited)**

General Minor Tracks

Department of Civil Engineering

S.No.	Course Name	L	T	P	C
1	Building Materials and Construction	3	1	0	4
2	Surveying	3	1	0	4
3	Environmental Engineering	3	1	0	4
4	Quantity Surveying	3	1	0	4
5	Construction Technology and Management	3	1	0	4
6	Environmental Pollution and Control	3	1	0	4

Note:

1. Students can opt any 4 subjects from the pool
2. Compulsory MOOC/NPTEL course for 4 credits (2 course, each 2 credited)

VVIT Life skill courses

The following courses are admitted to be the **courses beyond curriculum** to improve individual life skills. These courses and will be demonstrated in the class room and will be having an internal assessment for satisfactory.

S. No	Year and Semester	Course Name
1	I Year I Semester (Semester-1)	Quantitative Aptitude
2	I Year II Semester (Semester-2)	Verbal Ability
3	II Year I Semester (Semester-3)	Understanding Self for Effectiveness
4	II Year II Semester (Semester-4)	Design Thinking
5	III Year I Semester (Semester-5)	Stress and Coping Strategies
6	III Year II Semester (Semester-6)	Research Skills

I-Year-I Semester		L	T	P	C
		3	0	0	3

Communicative English (20SH1T02)

Course objectives:
The main objectives are

1. Adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions.
2. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
3. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
4. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
5. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
6. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

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

CO1	identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and formulate sentences using proper grammatical structures and correct word forms **(Describe, relate, tell, find L-3)**
CO2	speak clearly on a specific topic using suitable discourse markers in informal discussions **(Discuss, outline, explain, predict – L3)**
CO3	write summaries based on global comprehension of reading/listening texts **(Use, categorize, complete, solve L-3)**
CO4	produce a coherent paragraph interpreting a figure/graph/chart/table **(Identify, compare, explain, illustrate- L4)**
CO5	take notes while listening to a talk/lecture to answer questions **(explain, relate, outline, complete -L3)**

Unit – 1: **13 HOURS**

Detailed Study: A Proposal to Girdle the Earth (Excerpt) by Nellie Bly

Theme: Exploration

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.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Non-Detailed Study:

1. "How to Fashion Your Own Brand of Success" by Howard Whitman

2. "How to Recognize Your Failure Symptoms" by Dorothea Brande

Unit-2: **13 HOURS**

Detailed Study: An excerpt from The District School as It Was by One Who Went to It by Warren Burton

Theme: On Campus

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Cohesive devices - linkers, signposts and transition signals; use of articles and zero article; prepositions.

Non-detailed Study:

3. "How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock

4. "How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz

Unit-3: **13 HOURS**

Detailed Study: The Future of Work?

Theme: Working Together

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Non-Detailed Study:

5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand

6. "How to Raise Your Self-Esteem and Develop Self-confidence" by James W Newman

Unit-4: **13 HOURS**

Detailed Study: H.G Wells and the Uncertainties of Progress by Peter J. Bowler

Theme: Fabric of Change

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: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Non-Detailed Study

7. "How to Win Your War against Negative Feelings" by Dr Maxwell Maltz

8. "How to Find the Courage to Take Risks" by Drs. Tom Rusk and Randy Read

Unit-5: **13 HOURS**

Detailed Study: Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far

Theme: Tools for Life

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.
Reading: Reading for comprehension.
Writing: Writing structured essays on specific topics using suitable claims and evidences
Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Non-Detailed Study
9. "How to Become a Self-Motivator" by Charles T Jones
10. "How to Eliminate Your Bad Habits" by OgMandino

Text books:

1. English All Round: Communication Skills for Undergraduate Learners-Volume 1, Orient Black Swan, 2019
2. University of Success by OgMandino, Jaico, 2015.

Reference books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

AICTE Recommended Books

5. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Oxford University Press, 2018.
6. Pushplata and Sanjay Kumar. Communication Skills, Oxford University Press, 2018.
7. Kulbushan Kumar. Effective Communication Skills. Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing
1-language.com
http://www.5minuteenglish.com/
https://www.englishpractice.com/
Grammar/Vocabulary
English Language Learning Online
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/
http://www.nonstopenglish.com/
https://www.vocabulary.com/
BBC Vocabulary Games
Free Rice Vocabulary Game
Reading
https://www.usingenglish.com/comprehension/
https://www.englishclub.com/reading/short-stories.htm
https://www.english-online.at/
Listening
https://learningenglish.voanews.com/z/3613
http://www.englishmedialab.com/listening.html
Speaking

https://www.talkenglish.com/
BBC Learning English – Pronunciation tips
Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/
http://www.world-english.org/
http://learnenglish.britishcouncil.org/

*****

I-Year-I Semester		L	T	P	C
		2	1	0	3

Mathematics-I (20SH1T01)

Preamble: This course illuminates the students in the concepts of calculus.

Course objectives:

The main objectives are

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

CO1	solve the differential equations related to various engineering fields.
CO2	utilize mean value theorems to real life problems.
CO3	familiarize with functions of several variables which is useful in optimization.
CO4	apply double integration techniques in evaluating areas bounded by region.
CO5	learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3 – dimensional coordinate systems.

Unit–1: **13 HOURS**

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 – Orthogonal trajectories – Electrical circuits.

Unit–2: **13 HOURS**

Linear differential equations of higher order

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax}V(x)$ and $x^n V(x)$ - Method of Variation of Parameters.

Applications: LCR circuit – Simple harmonic motion

Unit–3: **12 HOURS**

Mean value theorems

Mean value theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

Unit–4: **14 HOURS**

Partial differentiation

Introduction – Homogeneous function – Euler's theorem **–** Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

Unit–5: **13 HOURS**

Multiple integrals

Double integrals (Cartesian and Polar) – Change of order of integration – Change of variables (Cartesian to Polar) –Triple integrals.

Applications: Areas by double integrals and Volumes by triple integrals.

Text books:

1. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference books:

1. **H. K. Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

*****

I-Year-I Semester		L	T	P	C
		2	1	0	3

ENGINEERING PHYSICS
(20SH1T03)

Course objectives:

Engineering Physics curriculum which is re-oriented to the needs of non-circuital branches of graduate engineering courses offered by Vasireddy Venkatadri Institute of Technology, which serves as a transit to understand the branch specific advanced topics.

The course is designed to:

- Impart Knowledge of physicaloptics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Impart knowledge in basic concepts of LASERs and Holography along with their engineering applications
- Impart the knowledge of materials with characteristic utility in appliances.
- Impart the knowledge on acoustic quality of concert halls and concepts of flaw detection techniques using ultrasonic.
- Study the structure- property relationship exhibited by solid materials within the elastic limit.

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

CO1	**Understand** the principles such as interference and diffraction to design and enhance the resolving power of various optical instruments.
CO2	**Learn** the basic concepts of LASER light Sources and Apply them to holography
CO3	**Study** the magnetic and dielectric materials to enhance the utility aspects of materials.
CO4	**Analyze** acoustic properties of typically used materials in buildings
CO5	**Understand** the concepts of shearing force and moment of inertia

Unit-I: Wave Optics: **13 HOURS**

Interference: PrincipleofSuperposition-Interferenceoflight – ConditionsforsustainedInterference-Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry)

Diffraction: Fraunhofer Diffraction: - Diffraction due to single slit (quantitative), double slit(qualitative), N –slits(qualitative) and circular aperture (qualitative) – Intensity distribution curves - Diffraction grating – Grating spectrum – missing order– resolving power – Rayleigh's criterion – Resolving powers of Microscope(qualitative), Telescope(qualitative) and grating (qualitative).

Unit– II: LASERs and Holography **13 HOURS**

LASERs: Interaction of radiation with matter – Spontaneous and Stimulated emission of radiation – population inversion – Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium-Neon laser – Applications.

Holography: Introduction – principle – differences between photography and holography – construction and reconstruction of hologram – applications of holograms

Unit-III: Magnetism and Dielectrics **13 HOURS**

Magnetism: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment - Bohr Magneton-Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Dielectrics: Introduction- Dielectricpolarization, Dielectric polarizability, Susceptibility and Dielectricconstant- Types of polarizations: Electronic and Ionic (Quantitative), Orientation Polarizations (Qualitative) - Lorentz Internal field-Claussius –Mossotti's equation- Frequency dependence of polarization - Applications of dielectrics.

Unit-IV: ACOUSTICS AND ULTRASONICS **15 HOURS**

Acoustics: Introduction **–** Reverberation - Reverberation time - Sabine's formula–absorption coefficient and its determination- factors affecting acoustics of buildings and their remedies.

Ultrasonics: Properties –Production of ultrasonics by Magnetostriction & Piezoelectric methods – Non-Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays–applications.

Unit-V: ELASTICITY **11 HOURS**

Stress & strain —stress &strain curve– generalized Hooke's law – different types of moduli and their relations – bending of beams – Bending moment of a beam – Depression of cantilever.

Text books:

1. "Engineering Physics" by B. K. Pandey, S. Chaturvedi - Cengage Publications, 2012
2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand, 2017.
3. "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
4. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference books:

1. "Engineering Physics" by M.R.Srinivasan, New Age international publishers (2009).
2. "Optics" by AjoyGhatak, 6th Edition McGraw Hill Education, 2017.
3. "Solid State Physics" by A.J.Dekker, Mc Millan Publishers (2011).

I-Year-I Semester		L	T	P	C
		1	0	4	3

ENGINEERING GRAPHICS (20ME1L01)

Course Objectives:
The main objectives are

1. Expose the students to use Drafting packages for generating Engineering curves and conventions followed in Preparation of engineering drawings.
2. Make the students to understand the concepts of orthographic projections of Lines and Plane Surfaces.
3. To understand the concepts of orthographic projections of Regular Solids.
4. Develop the ability of understanding sectional views and Development of Solid Surfaces.
5. Enable them to use computer aided drafting packages for Conversion of Isometric view to Orthographic Projection and vice versa.

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

CO1	Prepare engineering drawings as per BIS conventions Understand level, KL2}
CO2	Produce computer generated of orthographic projections of Lines and Plane surfaces using CAD software {Apply level, KL3}
CO3	Use the knowledge of orthographic projections of Solids to represent engineering information/concepts and present the same in the form of drawings {Apply level, KL3}
CO4	Use the knowledge of sectional views and Development of Solid Surfaces in Real time Applications {Apply level, KL3}
CO5	Develop isometric drawings of simple objects reading the orthographic projections of those objects {Analyze level, KL4}

UNIT-I: INTRODUCTION TO AUTOCAD: 15 HOURS

Basic commands, Customization, ISO and ANSI standards for coordinate dimensioning, Annotations, layering, 2D drawings of various mechanical components, 2D drawings of various electrical and electronic circuits. Creation of engineering models- floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; (Experiments should be Planned According to respective Core Branch Applications)

UNIT-II: THEORY OF PROJECTION: 12 HOURS

Principles of Orthographic Projections-Convention: Projections of Points, Projections of Lines inclined to both planes, Projections of planes inclined to one Plane & Projections of planes inclined to both Planes

UNIT III: PROJECTIONS OF REGULAR SOLIDS 12 HOURS

Projections of Solids –with the axis perpendicular to one of the principal planes, with the axis Inclined to one of the principal planes, Projections of Solids –with the axis Inclined to Both the principal planes

UNIT IV: DEVELOPMENT OF SURFACES & SECTIONAL ORTHOGRAPHIC VIEWS 13 HOURS

Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and, Cone. Draw the sectional orthographic views of geometrical solids

UNIT V: ISOMETRIC PROJECTIONS **13 HOURS**

Conversion of isometric views to orthographic views, drawing of isometric views - simple Solids, Conversion of orthographic views to isometric views of simple Drawings

Text books:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Graphics with Autocad by Kulkarni D.M, PHI Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age
4. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

Reference books:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. AutoCAD 2018 Training Guide (English, Paperback, Sagar Linkan) ISBN: 9789386551870, 938655187X RUPAPUBLICATIONS

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I-Year-I Semester		L	T	P	C
		2	1	0	3

Problem Solving using C (20CS1T01)

Course objectives:

The main objectives are

1. To familiarize to notion of an algorithm, editing and executing programs in Linux.
2. To Understanding branching, iteration.
3. To represent Data using arrays.
4. To use Modular programming and recursive solution formulation.
5. To familiarize pointers and dynamic memory allocation.
6. To handle data through files

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

CO1	**Understand** algorithms and basic terminology of C
CO2	**Solve** problems using control structures and modular approach
CO3	**Make** use of 1D and 2D arrays along with strings for linear data handling
CO4	**Determine** the use of pointers and structures
CO5	**Implement** various operations on data files.

UNIT-I: Introduction to C **13 HOURS**

Introduction to Computers: hardware, Memory hierarchy, Types of Computers, Types of Software – Operating Systems, Translators, Device drivers and packages. Algorithms and its characteristics, Program development steps. Structure of a C program, Features of C, The main () Function, Standard I/O functions.

Programming Style - Indentation, Comments, Identifiers, Data Types**,** Operators, Precedence and Associativity. Variables and Declarations, Format Modifiers, Escape Sequences, Types of Statements

Casting - Implicit Type Conversions, Explicit Type Conversions, Mathematical Library Functions

UNIT-II: Control Flow & Modules **13 HOURS**

Selection: if-else Statement, nested if, examples, Multiway selection: switch, else-if, examples.

Repetition: Basic Loop Structures, Pre-test and Post-test Loops, Counter-Controlled andCondition-Controlled Loops, for, while and do while.

Branching: break & continue.

Modular Programming: Function and Parameter Declarations, Returning a Value, Types of parameters. Parameter – scalar data as argument.

Recursion: Definition, Base condition for recursion, Mathematical Recursion, Recursion versus Iteration.

UNIT-III Arrays & Strings **12 HOURS**

Arrays: Introduction to Arrays, Input and Output of Array Values, Array Initialization, Arrays as Function Arguments, Two-Dimensional Arrays, Larger Dimensional Arrays- Matrices, 1D & 2D arrays as arguments.

Strings: String Fundamentals, String Input and Output, String Processing, Library Functions, Strings as arguments.

Unit – IV Pointers & Structures **14 HOURS**

Pointers: Concept of a Pointer, Initialization of Pointer variables, Pointers as function arguments,

Passing by address, Dangling memory, Pointer Arithmetic, Character pointers, Pointers to Pointers, Array of pointers & Pointer to array, Dynamic memory management functions, Command line Arguments.

Structures: Derived types, Structure's declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, enum, bit-fields.

UNIT-V: Files **13 HOURS**

Storage classes – auto, static, extern, register. Pre-processor statements

Data Files: Declaring, Opening, and Closing File Streams, File handling functions, Reading from and Writing to Text Files, File copy, merge, Writing and reading records, Random File Access.

Text books:

1. ANSI C Programming, E Balaguruswamy, Mc-GrawHill, 5th Edition
2. ANSI C Programming, Gary J. Bronson, Cengage Learning.
3. Programming in C, ReemaThareja, OXFORD Publications

Reference books:

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Let us C, YashwantKanetkar, BPB Publications
3. Mastering in C, KR Venu Gopal, TMH

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I-Year-I Semester		L	T	P	C
		0	0	3	1.5
COMMUNICATIVE ENGLISH LAB (20SH1L01)					

Course Objective:

The main objective of the course is to adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions and appear confidently for competitive examinations for career development.

The specific objectives of the course are to

1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native and non-native speakers
2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials like newspapers, magazines, periodicals, journals, etc.
3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
4. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

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

CO1. Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)

CO2. Take notes while listening to a talk/lecture; to answer questions in English; formulate sentences using proper grammatical structures and correct word forms; and use language effectively in competitive examinations (L3)

CO3. Write summaries based on global comprehension of reading/listening texts; produce a coherent write-up interpreting a figure/graph/chart/table; and use English as a successful medium of communication. (L3)

Detailed Syllabus

Introduction to Sound system of English

Articulation - Airstream mechanism, Manners of Articulation, Places of Articulation, English phonetic symbols.

Accent - Syllabification, word stress and accent, stress rules and stress shift, exceptions to rules.

Intonation - Stress and accent in connected speech. Types and functions of Intonation in English.

I. **A. Speaking**: Introducing Yourself and Others
B. Listening: Conversation between two and more people.

II. **A. Speaking:** Speak for a minute in response to a question about personal experience / wish.

B. Listening: Identifying the main idea of a talk or a conversation

III. **A. Speaking:Group discussion** – 5 minutes followed by a summary –1 or 2 minutes: Topics- 1. Features that make a place beautiful, 2. The most challenging job you can think of, 3. Some skills that everyone should learn, 4. The best criteria to measure success, 5. A recent news story that is interesting, 6. Impact of technology on the music industry, 7. An app that has helped society, 8. Pros and Cons of after school tutorials, 9. How to stay safe on Social Media, 10. The most common reasons why friendships fall apart, 11. Interactions with seniors on campus, 12. Coping with peer pressure, 13. Others' opinion vs your belief, 14. Feeling that plants would express if they could, 15. Growing up alone vs Growing up with siblings, 16. Uniforms stifle individuality, 17. In India summer is the best and worst of times, 18. A good sense of humour is a definite perk, 19. All fast food is not junk food and 20. Ideas to make your common room in college more inviting. Question Answer sessions – 1. Idea of a Tech Startup, 2. Training programme of T&P Cell, 3. Inter-college Cultural Fest, 4. 3-day Foreign University delegation visit to the campus, 5. Computer training programme by a reputed MNC, 6. Shifting your Dept or Classrooms to new location on campus, 7. How to manage attendance while attending additional courses (Minors/Honors), 8. How to choose placement offers? 9. Involvement in Student Affairs through SAC, 10. Planning an excursion.
B. Listening:1. Comprehension Exercise on Teamwork, 2. Predicting what the speaker would say from the title of the talk, 3. Comprehension based on a narrative or a short video, TED Talks

IV. **A. Speaking:** Preparing speech using picture clues, asking Q&A using pictures.
B. Listening: Listening Comprehension using short films, audio files, interviews of famous personalities

V. **A. Speaking:** Preparing 30-day planner,Using important phrasal expressions in speech, Oral Presentations on – 1. Setting goals is important2. Asking the right question is the skill you need to develop, 3. Do college students want their parents' attention4. Everyone needs to learn how to cook5. Doing household chores is everyone's responsibility 6. Study groups facilitate peer-monitoring7. Is it OK for students to do things just because they want to fit in? 8. Students should compulsorily make time for physical activity, 9. Taking breaks to pursue other interests improves academic performance, 10. Strategies to avoid stress, 11. How best to use the media for educational activities, 12. Why volunteer for service activities? 13. International student exchange programme, 15. Work-life balance 16. Strategies to build on your strength and overcome weaknesses, 17. Strategies to build confidence and self-esteem18. Procrastination kills opportunities, 19. Setting a budget and sticking to it, 20. Grooming and etiquette 21. Pros and Cons of being Competitive, 22. Virtual classroom vs real classroom, 23. Freedom brings more responsibility 24. To-do lists help you become more productive 25. Having a diverse group of friends is an asset 26. One thing you wish you had learnt in High school 27. Why is it important to be non-judgmental towards others? 28. Humans need empathy, 29. Public speaking is a necessary skill 30. How to build and maintain good professional relationships.
B. Listening: Listening Comprehension, Speeches by Famous personalities

Pair work, Role-play, conversational practice and Individual speaking activities based on following essays from University of Success.

1. "How to Fashion Your Own Brand of Success" by Howard Whitman

2. "How to Recognize Your Failure Symptoms" by Dorothea Brande

3. "How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock

4. "How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz
5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand
6. "How to Raise Your Self-Esteem and Develop Self-Confidence" by James W. Newman
7. "How to Win Your War against Negative Feelings" by Dr Maxwell Maltz
8. "How to Find the Courage to Take Risks" by Drs. Tom Rust and Randy Reed
9. "How to Become a Self-Motivator" by Charles T Jones
10. "How to Eliminate Your Bad Habits"byOgMandino

Text Books

1. English All Round: Communication Skills for Undergraduate Learners-Volume 1, Orient Black Swan, 2019
2. University of Success by OgMandino, Jaico, 2015.

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.

AICTE Recommended Books

1. Meenakshi Raman and Sangeeta Sharma. *Technical Communication.* Oxford University Press,2018.
2. Pushplata and Sanjay Kumar. *Communication Skills,* Oxford University Press, 2018.
3. Kulbushan Kumar. *Effective Communication Skills.* Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing

1. 1-language.com
2. http://www.5minuteenglish.com/
3. https://www.englishpractice.com/

Grammar/Vocabulary

4. English Language Learning Online
5. http://www.bbc.co.uk/learningenglish/
6. http://www.better-english.com/
7. http://www.nonstopenglish.com/
8. https://www.vocabulary.com/
9. BBC Vocabulary Games
10. Free Rice Vocabulary Game

Reading

11. https://www.usingenglish.com/comprehension/
12. https://www.englishclub.com/reading/short-stories.htm
13. https://www.english-online.at/

Listening

14. https://learningenglish.voanews.com/z/3613
15. http://www.englishmedialab.com/listening.html

Speaking

16. https://www.talkenglish.com/
17. BBC Learning English – Pronunciation tips
18. Merriam-Webster – Perfect pronunciation Exercises

All Skills

19. https://www.englishclub.com/
20. http://www.world-english.org/
    http://learnenglish.britishcouncil.org/

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I-Year-I Semester		L	T	P	C
		0	0	3	1.5

ENGINEERING PHYSICS LAB (20SH1L03)

Course Objectives:

The Applied Physics Lab is designed to:

Understand the concepts of interference and diffraction and their applications.
Apply the concept of LASER in the determination of wavelength.
Recognize the importance of energy gap in the study of conductivity and Hall Effect.
Illustrate the magnetic and dielectric materials applications.
Apply the principles of semiconductors in various electronic devices.

Course Outcomes:

The students will be able to:

1. Operate optical instruments like microscope and spectrometer
2. Determine thickness of a paper with the concept of interference
3. Estimate the wavelength of different colours using diffraction grating and resolving power
4. Plot the intensity of the magnetic field of circular coil carrying current with distance
5. Calculate the band gap of a given semiconductor

LIST OF EXPERIMENTS (Any 10 of the following listed 15 experiments)

1. Determination of wavelength of a Source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
5. Energy Band gap of a Semiconductor p - n junction.
6. Characteristics of Thermistor – Temperature Coefficients
7. Determination of dielectric constant by charging and discharging method
8. Variation of dielectric constant with temperature
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. LASER - Determination of wavelength by plane diffraction grating
11. Verification of laws of vibrations in stretched strings – Sonometer.
12. Determine the radius of gyration using compound pendulum
13. Rigidity modulus of material by wire-dynamic method (torsional pendulum)
14. Dispersive power of diffraction grating.
15. Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall Effect.

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I-Year-I Semester		L	T	P	C
		0	0	3	1.5

PROBLEM SOLVING USING C LAB (20CS1L01)
(Common to All Branches)

Course Objectives:

1. Apply the principles of C language in problem solving.
2. To design flowcharts, algorithms and knowing how to debug programs.
3. To design & develop of C programs using arrays, strings pointers & functions.
4. To review the file operations, pre-processor commands.

Course Outcomes: By the end of the Lab, the student able to

1. **Comprehend** the various concepts of a C language
2. **Develop** algorithms and flowcharts
3. **Design** and development of C problem solving skills.
4. **Acquire** modular programming skills.

Exercise 1

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.

2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.

3. Write a C program to display multiple variables.

Exercise 2

1. Write a C program to calculate the distance between the two points.

2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3

1. Write a C program to convert a string to a long integer.

2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4

1 .Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum.

1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.

3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5

1. Write a program in C to print all unique elements in an array.

2. Write a program in C to separate odd and even integers in separate arrays.

3. Write a program in C to sort elements of array in ascending order.

Exercise 6

1. Write a program in C for multiplication of two square Matrices.

2. Write a program in C to find transpose of a given matrix.

Exercise 7

1. Write a program in C to search an element in a row wise and column wise sorted matrix.

2. Write a program in C to print individual characters of string in reverse order.

Exercise 8

1. Write a program in C to compare two strings without using string library functions.

2. Write a program in C to copy one string to another string.

Exercise 9

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11

1. Write a program in C to add numbers using call by reference.

2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12

1. Write a program in C to swap elements using call by reference.

2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13

1. Write a program in C to show how a function returning pointer.

2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand & write the difference.

2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15

1. Write a program in C to check whether a number is a prime number or not using the function.

2. Write a program in C to get the largest element of an array using the function.

Exercise 16

1. Write a program in C to append multiple lines at the end of a text file.

2. Write a program in C to copy a file in another name.

3. Write a program in C to remove a file from the disk.

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I-Year-II Semester		L	T	P	C
		2	1	0	3

MATHEMATICS-II (20SH2T01)

Course objectives:

The main objectives are

1. To elucidate the different numerical methods to solve nonlinear algebraic equations
2. To disseminate the use of different numerical techniques for carrying out numerical integration
3. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications

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

CO1	Evaluate approximate in the roots of polynomial and transcendental equations by different algorithms (EVALUATE)
CO2	Solve system of linear algebraic equations using Gauss Jacobi, Gauss Seidel and apply Newton's forward and backward interpolation and Lagrange's formulae for equal and unequal intervals (SOLVE,APPLY, FIND)
CO3	Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations and also by Laplace the transforms for solving differential equations (SOLVE,APPLY, FIND)
CO4	Find or compute the Fourier series of periodic signals (SOLVE, APPLY, FIND, ANALYSE)
CO5	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to range of non-periodic waveforms (SOLVE, APPLY, FIND)

UNIT-1: Iterative methods **11 HOURS**

Introduction–Bisection method–Method of false position–Iteration method–Newton-Raphson method (one variable)–Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT-2: Interpolation **14 HOURS**

Introduction–Errors in polynomial interpolation–Finite differences–Forward differences–Backward differences–Central differences –Relations between operators–Newton's forward and backward formulae for interpolation–Gauss's forward and backward formulae for

Interpolation – Interpolation with unequal intervals–Lagrange's interpolation formula–Newton's divide difference formula.

UNIT-3: Numerical integration and solution of ordinary difference equations **12 HOURS**

Trapezoidal rule–Simpson's $1/3^{rd}$ and $3/8^{th}$ rule–Solution of ordinary differential equations by Taylor's series–Picard's method of successive approximations–Euler's method–Modified Euler's method–Runge-Kutta method (second and fourth order).

UNIT–4: Laplace Transforms: **14 HOURS**

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function –Periodic function - Inverse Laplace transforms – Convolution theorem (without proof)

Applications: Evaluation of integrals using Laplace transforms - Solving ordinary differential equations (Initial value problems) using Laplace transforms.

UNIT 5: Fourier series and Fourier Transforms: **14 HOURS**

Fourier series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) - Fourier sine and cosine integrals – Sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

Text books:

1. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers

Reference books:

1. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **H.K.Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

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I-Year-II Semester		L	T	P	C
		2	1	0	3

ENGINEERING CHEMISTRY (20SH2T05)

Knowledge of basic concepts of chemistry for engineering students will help them as professional engineers later in design and material selection as well as utilizing the available resources.

Course objectives:

1. Significance and use of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
2. Outline the basics for the construction of electrochemical cells, batteries and fuel cells.Understand the mechanism of corrosion and how it can be prevented.
3. Importance of advanced materials and their engineering applications.
4. Differentiate and discuss the materials used in major industries like steel industry, metallurgical industries, construction industries, electrical equipments and manufacturing industries. Lubrication is also summarized.
5. Essentiality of fuel technology.
6. Need of water purification and importance of various water purification methods.

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

CO1	explain the preparation, properties and applications of thermoplastics, thermosettings, elastomers and conducting polymers.
CO2	know the importance of various materials and their uses in the construction of batteries and fuel cells.
CO3	to acquire the knowledge of nanomaterials, refractories, lubricants and cement.
CO4	assess the quality of various fuels.
CO5	understand the importance of water and its usage in various industries.

UNIT-I: POLYMER TECHNOLOGY 13 HOURS

Polymerisation*:* Introduction-Methods of polymerisation-(emulsion and suspension)-Physical and mechanical properties.

Plastics*:* Compounding-Fabrication (compression, injection, blown film, extrusion)-Preparation, properties and applications of PVC, ploycarbonates and Bakelite-Mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers*:* Natural rubber-Drawbacks-Vulcanization-Preparation-Propertiesand applications of synthetic rubbers (Buna S, thiokol and polyurethanes)

Composite Materials: Fiber reinforced plastics-CFRP and GFRP.

Conducting polymers: Polyacetylene, doped conducting polymers- p-type and n-type doping.

Bio degradable polymers: Biopolymers and biomedical polymers.

UNIT-II: ELECTROCHEMICAL CELLS AND CORROSION 13 HOURS

Single electrode potential-Electrochemical series and uses of series-Standard hydrogen electrode, calomel electrode, concentration cell, construction of glass electrode, Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li-ion battery, Zinc air cells, Fuel cells-H_2 –O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

Corrosion: Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, water-line corrosion- passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control: (proper designing, cathodic protection)-

protective coatings: cathodic and anodic coatings, electroplating, electroless plating (nickel), paints (constituents and its functions).

UNIT-III: CHEMISTRY OF MATERIALS 14 HOURS

Nano materials: Introduction, sol-gel method, characterization by BET, SEM and TEM methods, applications of graphene- carbon nanotubes and fullerenes: Types, preparation of carbon nanomaterials by carbon-arc, laser ablation method, and applications.

Refractories: Definition , classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.

Lubricants: Definition, mechanism of lubricants and properties (definition and importance).

Cement: Constituents, manufacturing, parameters to characterize the Clinker formation: lime saturation factor (LSF), silica ratio (SR), and alumina ratio (AR). Chemistry of setting and hardening, deterioration of cement.

UNIT-IV: FUELS 13 HOURS

Introduction-calorific value - HCV and LCV – problems using Dulong's formula – proximate and ultimate analysis of coal sample – significance of these analysis – problems – petroleum (refining – cracking) – synthetic petrol (Fischer-Tropsch & Bergius) – petrol knocking, diesel knocking – octane and cetane rating – anti-knocking agents – introduction to alternative fuels (bio-diesel, ethanol, methanol, natural gas, LPG, CNG) – Flue gas analysis by Orsat apparatus – rocket fuels.

UNIT-V: WATER TECHNOLOGY 12 HOURS

Hardness of water – determination of hardness by complexometric method – boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement) – internal treatments – softening of hard water (zeolite process and ion exchange process) – treatment of industrial waste water – potable water and its specifications – steps involved in purification of water – chlorination, break point chlorination – reverse osmosis and electro dialysis.

Text books:

1. Engineering Chemistry by Jain & Jain; Dhanpat Rai Publicating Co., Latest Edition
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 Edition.
3. Engineering Chemistry by Prasanth Rath, B. Ramadevi, Ch. Venkata Ramana Reddy, Subendu Chakravarthy; Cengage Publications, 2019 Edition.

Reference books:

1. A text book of Engineering Chemistry by S.S. Dara, S. S. Umare; S. Chand & Co., Ltd., Latest Edition.
2. Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publicating Co., Latest Edition.

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I-Year-II Semester		L	T	P	C
		3	0	0	3

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING(20EE2T02)

Course objectives:

1. To introduce basics of electric circuits and to teach DC and AC electrical circuit analysis.
2. To explain the working principles DC machines and speed control of various DC motors.
3. To explain the working principles of transformers and AC machines and its applications.
4. To introduce the basics of semiconductor physics and operation and applications of Diodes.
5. To introduce the basics of transistors and explain the transistor configurations

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

CO1	Apply concepts of KVL/KCL in solving DC circuits. (Apply, Find, Solve)
CO2	Choose correct machine for a specific application. (Understand, Apply)
CO3	Illustrate working principles of DC and AC Machines. (Understand, Apply)
CO4	Describe working principles of diodes and transistors. (Understand, Apply)
CO5	Understand the applications of diodes and transistors. (Understand, Analyze)

Unit 1 DC & AC Circuits: **14 HOURS**

DC Circuits:

Electrical circuit elements (R - L and C) – Kirchhoff's laws -Voltage and Current division rules-series, parallel circuits and star-delta and delta-star transformations- [Elementary treatment only]

AC Circuits:

Representation of sinusoidal waveforms - Peak and RMS values - phasor representation - real power - reactive power - apparent power - power factor.[Elementary treatment only]

Unit 2 DC Machines: **13 HOURS**

DC Generator:

Construction-Principle and operation of DC Generator - EMF equation -Types– Applications [Elementary treatment only]

DC Motor:

Principle and operation of DC Motor – types-Torque equation - Speed control of DC Motor-Brake test- Swinburne's test-Applications. [Elementary treatment only]

Unit 3 AC Machines: **13 HOURS**

Single Phase Transformer:

Construction, Principle and operation of Single-Phase Transformer –EMF Equation-Losses-Efficiency. [Elementary treatment only]

Three Phase Induction Motor: Construction- Principle and operation of three phase Induction Motor-Types- Applications. [Elementary treatment only]

Unit 4 Semiconductor Devices: **13 HOURS**

Semiconductor Physics, PN Junction Diode & Zener Diode-characteristics- Applications: Rectifiers (Half Wave Rectifier & Full Wave Rectifier) [Elementary treatment only], Clippers and Clampers.

Unit 5 Bipolar Junction Transistors: **12 HOURS**

Construction and working of bipolar junction transistor, CB, CE and CC Configurations and characteristics. [Elementary treatment only], Transistors as amplifiers, op-amp basics.

Text books:

1. D. P. Kothari and I. J. Nagrath- "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

Reference books:

1. L. S. Bobrow- "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.

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I-Year-II Semester		L	T	P	C
		3	0	0	3

BUILDING MATERIALS AND CONSTRUCTION (20CE2T01)

Course objectives:
The main objectives are

1. Identify various building materials and their structural requirements.
2. Review different types of masonry construction.
3. Explain the significance of cement and lime in construction.
4. Identify the suitable material for construction and various building components.
5. Discuss about various building services and finishing.

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

CO1	Identify suitability of stones, bricks, tiles, glass and steel as building materials. {Understand level, KL2}
CO2	Make out the appropriate masonry to be used for building construction and importance of wood {Apply level, KL3}
CO3	Recognize the importance of lime and cement as building materials. {Understand level, KL2}
CO4	Pick up the appropriate building components for comfortable construction. {Apply level, KL3}
CO5	Identify the appropriate type of finishing techniques and building services which are generally used in buildings. {Understand level, KL2}

Unit-I: BUILDING MATERIALS-I 12 HOURS

Stones: Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone

Aggregates: Classification of aggregate – Coarse and fine aggregates

Bricks: Composition of good brick earth, various methods of manufacturing of bricks.

Unit– II: BUILDING MATERIALS-II13 HOURS

Tiles: Characteristics of good tile - manufacturing methods, types of tiles.

Steel: General; Manufacture of steel; Uses of steel; Market forms of steel.

Glass: Manufacture of glass

Wood: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber

Unit-III: BUILDING MATERIALS-III14 HOURS

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

Unit-IV: BUILDING COMPONENTS AND MASONRY 13 HOURS

Building Components: Lintels, arches, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, Types of roofs – King and Queen post Trusses. R.C.C Roofs, Pre-

fabricated roofs.

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

Unit-V: BUILDING SERVICES AND FINISHES 13 HOURS

Building Services: Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements.

Finishing: 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.

Formwork, Scaffolding

Text books:

1. Engineering Materials by S.C.Rangwala
2. Building Materials, B. C. Punmia, Laxmi Publications private ltd.
3. Building Construction, B.C. Punmia, Laxmi Publications (p) ltd.

Reference books:

1. S.K. Duggal "Building Materials"- New age International Publisher,
2. R.K. Rajput "Engineering Materials (Including construction materials)"-, S.Chand Publications.
3. P.C Varghese "Building Construction" Prentice-Hall of India Private Ltd.

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I-Year-II Semester		L	T	P	C
		2	1	0	3

ENGINEERING MECHANICS (20ME2T02)

Course objectives:
The main objectives are

1. To understand the resolution of forces, equilibrium of force systems
2. To learn the analysis of forces in the structures and also the basic concepts of friction and its Applications to simple systems.
3. To understand the concepts of centroid, moment of inertia, centre of gravity and mass moment of inertia.
4. To understand the basic concepts of kinematics and kinetics.
5. To learn the concepts of work energy method and impulse momentum

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

CO1	Compute the resultant and moment of a force system and apply the equations of equilibrium for a generalized force system **(Apply)**
CO2	Solve the forces in trusses, frames and also friction in various mechanical devices. **(Apply)**
CO3	Interpret the centroids, centers of gravity and moments of inertia of simple geometric shapes and understand the physical applications of these properties. (**Apply**)
CO4	Apply the basic concepts of dynamics to solve problems of engineering applications (**Apply**)
CO5	Solve problems using work energy equations for translation, fixed axis rotation and plane motion. (**Apply**)

UNIT- I: INTRODUCTION TO ENGINEERING MECHANICS 13 HOURS

Force systems: Basic Concepts, Resultant of coplanar concurrent forces, Components of force in space, Moment of force and its applications, couples and resultant of force systems, Equilibrium of Force Systems, Free body diagram, Equations of equilibrium, Equilibrium of planar and spatial system.

UNIT-II: ANALYSIS OF STRUCTURES AND FRICTION 11 HOURS

Trusses: Introduction, Analysis of trusses by method of joints, method of sections;

Friction: Introduction to Friction, Laws of friction, Application to simple systems and connected systems.

UNIT-III: CENTROID AND CENTRE OF GRAVITY, AREA MOMENT OF INERTIA AND MASS MOMENT INERTIA 14 HOURS

Centroid: Centroid of simple figures from basic principles, centroid of composite sections;

Centre of Gravity: Center of gravity of simple body from basic principles, Center of gravity of composite bodies, Pappus theorems.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Introduction of Mass Moment of Inertia, mass moment of inertia of composite bodies

UNIT IV: INTRODUCTION TO KINEMATICS AND KINETICS 14 HOURS

Kinematics: Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

UNIT – V: WORK -ENERGY METHOD 13 HOURS

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

Text books:

1. Reddy Vijay Kumar K. and K. Suresh Kumar (2010), Singer's Engineering Mechanics.

2.S.P. Timoshenko and D.H. Young, Engineering Mechanics, McGraw-Hill International Edition,1983.

3. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Reference books:

1. Engineering Mechanics statics and dynamics – R.C. Hibbeler, 11th Edn – Pearson Publ.

2. Mechanics for Engineers, statics - F.P. Beer & E.R. Johnston – 5th Edn Mc Graw Hill Publ.

3. Engineering Mechanics statics and dynamics, A Nelson, Mc Graw Hill publications

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I-Year-II Semester		L	T	P	C
		0	0	3	1.5

CIVIL WORKSHOP PRACTICE LAB (20CE2L01)

Course objectives: The course content aims to

1. Familiarize various tools and techniques used in carpentry
2. Train on different welding techniques
3. Understand building house wiring
4. Understand brick masonry methods
5. Familiarize various components used for Plumbing

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

CO1	Understand variouscarpentry tools and techniques **{Understand}**
CO2	Develop different welding joints **{Apply level}**
CO3	Understand wiring methods for various electrical fittings. **{Understand}**
CO4	Differentiate construction of brick masonry in English and Flemish bond methods **{Analyze}**
CO5	Recognize various components and their functions of elements used for Plumbing **{Remember}**

Section	Contents	Mapped CO
I	**Carpentry** 1. Half-lap joint: Join two wooden blocks with the help of half-lap joint. 2. Dovetail joint: Join two wooden blocks with the help of dovetail joint. 3. Sawing and finishing: Prepare a plain smooth block (cuboid) of timber of given dimension using sawing and planning operations.	**CO1**
II	**Welding** 1. Fillet welding: Join two given plates at right angle using fillet weld. 2. But welding: Join two given plates using but weld. 3. Spot welding: Lap joint of two thin sheets using resistance spot welding.	**CO2**
III	**House wiring** 1. Parallel and series connection of two bulbs 2. Tube light and fan with regulator wiring 3. Bulb operating with Two way switch 4. Control and regulation of electrical devices using sensors	**CO3**

IV	**Masonry** 1. Assemble a L shape brick wall of 0.9 m length and 0.6 m height on each side with 9" and 4.5" thicknesses by arranging bricks in English bond (using only wet mud as mortar). Ensure that wall is in line, plumb and at right angle to a given structure 2. Assemble a T shape brick wall of 1.2 m length and 0.6 m height on each side with 9" and 4.5" thicknesses by arranging bricks in Flemish bond (using only wet mud as mortar). Ensure that wall is in line, plumb and at right angle to a given structure 3. Mark level of given height from ground level at different locations in the workshop using water pipe technique	**CO4**
V	**Plumbing** 1. Identify various supply pipes and pipe fittings (like pipes of different diameter, nipple, reducer, union, T, elbow, tap etc) used in plumbing. 2. Identify various drain pipes and sanitary fittings(like p-trap, gully trap, etc) used in plumbing. 3. Assemble a pipe line as per given drawing using pipes of one inch diameter, pipes of half inch diameter, nipple, reducer, union, T, elbow, tap etc. (This may involve basic tasks such as marking, cutting, threading, etc and use of appropriate techniques so that water leakage does not occur) and then dissemble this pipe line. 4. Various chemicals used for water sealing.	**CO5**

***Any 2 experiments from each section should be completed.**

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I-Year-II Semester		L	T	P	C
		0	0	3	1.5

ENGINEERING CHEMISTRY LAB (20SH2L05)

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations quantitative analysis .

Course objectives:

1. To furnish the students with a solid foundation in Chemistry Laboratory required to solve the Engineering problems.
2. To expose the students in practical aspects of the theoritical concepts like pH, hardness of water etc.
3. To guide the students on how to handle the instruments like UV-visible spectrophotometer, potentiometer and conductometer.

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

CO1	To estimate the amount of metal ions present in different solutions (L4 & L3)
CO2	To analyze the quality parameters of water (L4)
CO3	To determine the strength of different solutions by using different instrumentation techniques (L3)

List of Experiments: (Any 10 of the following listed 16 experiments)

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Copper (II) using standard EDTA solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Iron (III) by colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metric method).
9. Determination of concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ presence in an egg shell.
13. Estimation of vitamin- C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Prepatation of nylon-6, 6 and Bakelite (demonstration only)

Reference Books:

A Text Book of Quantitative Analysis, Arthur J. Vogel.

I-Year-II Semester		L	T	P	C
		0	0	3	1.5

BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING LAB (20EE2L02)

Course objectives:

1. To Verify Kirchhoff's laws, Voltage and Current division rules.
2. To learn speed control and testing of DC Shunt Motor.
3. To learn and understand the operation of induction motor.
4. To learn applications of diodes and transistors.

Course Outcomes

CO1.	Verify Kirchhoff's Laws and voltage and current division rules for DC supply.
CO2.	Analyze the performance of AC and DC Machines by testing.
CO3.	Perform speed control of DC shunt motor.
CO4.	Perform the half wave and full wave rectifier.

List of Experiments: -

1. Verification of Kirchhoff laws.
2. Verification of Voltage division rule and current division rule.
3. Speed control of DC Shunt Motor.
4. Perform Brake test on DC Shunt Motor.
5. Conduct Swinburne's test on DC Shunt Motor.
6. Brake test on 3-phase Induction Motor.
7. Draw the V-I characteristics of P-N Junction Diode.
8. Draw the V-I characteristics of zener Diode.
9. Half wave rectifier and Full wave rectifier operations using diodes.
10. Draw the BJT-CB Configuration characteristics.
11. Draw the BJT-CE Configuration characteristics.
12. Draw the BJT-CC Configuration characteristics.
13. Study of circuit simulation software (any one- TINA-PRO/ PSPICE/ CIRCUIT MAKER/ GPSIM/ SAPWIN etc).

Text Books

1. D. P. Kothari and I. J. Nagrath- "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006

References:

1. L. S. Bobrow- "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson – 201

I-Year-II Semester		L	T	P	C
		2	0	0	0

INDIAN CONSTITUTION (20SH2N01)

Course objectives:

1. To Enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative.

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

CO1	Know the sources, features and principles of Indian Constitution.
CO2	Learn about Union Government, State government and its administration.
CO3	Get acquainted with Local administration and Pachayati Raj.
CO4	Be aware of basic concepts and developments of Human Rights.
CO5	Gain knowledge on roles and functioning of Election Commission

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT-IV

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women

Reference books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd..

New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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II-Year-I Semester		L	T	P	C
		2	1	0	3

MATHEMATICS – III (20SH3T01)

Course objectives:
The main objectives are

1. Instruct the concept of Matrices in solving linear algebraic equations.
2. Familiarize the techniques in partial differential equations
3. Furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications

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

CO1	develop the use of matrix algebra techniques that is needed by engineers for practical applications
CO2	solve system of linear algebraic equations using Gauss elimination, Gauss Jordan
CO3	to interpret the physical meaning of different operators such as gradient, curl and divergence
CO4	estimate the work done against a field, circulation and flux using vector calculus
CO5	identify the solution methods for partial differential equation that model physical processes

Unit–1: Solving system of linear equations, Eigen values and Eigen Vectors13 HOURS
Rank of a matrix by Echelon form and normal form–solving system of homogeneous and non-homogeneous linear equations–Gauss elimination, Gauss Jordan for solving system of equations-Eigen values and Eigen vectors and their properties

Unit–2: Cayley-Hamilton theorem and quadratic forms13 HOURS
Cayley-Hamilton theorem (without proof)–Finding inverse and power of a matrix by Cayley-Hamilton theorem–Reduction to Diagonal form–Quadratic forms and nature of the quadratic forms–Reduction of quadratic form to canonical forms by orthogonal transformation.
Application: Free vibration of two mass systems.

Unit–3: Vector Differentiation13 HOURS
Scalar and Vector point functions-Vector Differential operator- Gradient – Directional derivatives – Divergence – Curl – Laplacian second order operator- Vector identities- Scalar Potential.

Unit–4: Vector Integration12 HOURS
Line integral – Work done – Circulation- Surface integral- Volume integral
Vector integral theorems (without proof): Green's theorem in a plane- Stokes theorem- Gauss Divergence theorem.

Unit–5: Solutions of Partial differential Equations14 HOURS
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.
Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Text books:

1. B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference books:

1. B.V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. H.K. Das, Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

e-resources:
1. https://www.freebookcentre.net/maths-books-download/Linear-Algebra-A-free-Linear-Algebra-Textbook-and-Online-Resource.html

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II-Year-I Semester		L	T	P	C
		2	1	0	3

STRENGTH OF MATERIALS (20CE3T01)

Pre-Requisites: Knowledge in Engineering Mechanics.

Course objectives:
The main objectives are

1. To give preliminary concepts of strength of materials and principles of elasticity and plasticity, stress strain behavior of materials and their governing laws. The modulli of elasticityand their relations.
2. To impart concepts of bending moment and shear force for beams with different boundary and loading conditions and to draw the diagrams which shows variation along the span
3. To impart the concepts ofmeasuring deflections in beams under various loading and supportconditions
4. To give concepts of stresses developed in the cross section using bending and shear stress equations.
5. To give concepts of torsion and governing torque equation, the power transmitted by shafts and deflection of close and open coiled springs under axial pull and axial couple.

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

CO1	***Analyse*** the stresses and strains in a member subjected to different loadings and understand the strain energy under different load conditions. (Understanding, Analysing)
CO2	***Apply*** different methods and analyse the various beams subjected to different loads using shear force and bending moment diagrams (Applying, Analysing)
CO3	***Compute*** deflections in beams due to different loading conditions.(Applying)
CO4	***Evaluate*** flexure and shear stresses for different beam sections. (Evaluating)
CO5	***Analyse*** the shafts and springs by applying principle of torsion (Applying, Analysing)

UNIT-I: SIMPLE STRESSES AND STRAINS **14 HOURS**

Elasticity and plasticity (Definitions) – Types of stresses and strains– Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety, Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section-simple problems – composite bars – Temperature stresses(Concept only).

Strain energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications

UNIT– II: SHEAR FORCE AND BENDING MOMENT **13 HOURS**

Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads (simple problems), uniformly distributed load, uniformly varying loads and combination of these loads– Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT- III: DEFLECTION OF BEAMS **12 HOURS**

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

Unit-IV: FLEXURAL STRESSES AND SHEAR STRESSES 14 HOURS

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: M/I =f/y = E/R – 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 beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T and angle sections.

Unit-V: TORSION OF CIRCULAR SHAFTS AND SPRINGS 12 HOURS

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations: – Assumptions made in the theory of pure torsion – Torsion moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust.

Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple –springs in series and parallel.

Text books:

1. "Strength of materials", by R. K. Bansal, Volume 1 and 2.
2. "Strength of materials", by S.S. Bhavakati.

Reference books:

1. Strength of Materials by S.S. Rattan, Tata McGraw Hill Education Pvt. Ltd.
2. Strength of materials by R.K. Rajput, S. Chand & Co, New Delhi.
3. Strength of Materials by S.Ramamrutham, Dhanpat Rai Publishing Co., (P) Ltd. New Delhi
4. Theory of Structures by S.P.Timoshenko& DH. Young.

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II-Year-I Semester		L	T	P	C
		2	1	0	3

FLUID MECHANICS (20CE3T02)

Course objectives:

The main objectives are

1. Understand the properties of fluid and their behavior at various conditions.
2. Understand the various forces acting on hydraulic structures and flow properties.
3. Understand the concept of conservation of mass and its application.
4. Understand the concept of energy and momentum conservation and their application.
5. Study behavior of fluid at various fluid properties and characteristics.
6. Study the energy losses in pipe flow and measurement of flow in pipes.

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

CO1	Explain the influence of the fluid properties in static condition and motion. (Understand)
CO2	State and explain hydrostatic forces on submersible hydraulic structures. (Apply)
CO3	Estimate various properties and characteristics in a pipe flow using continuity, momentum and energy equations. (Apply)
CO4	Analyze the behavior of fluids using mathematical equations in Laminar and Turbulent conditions. (Analyze)
CO5	Apply various devices to measure the flow in pipes and tanks. (Apply)

Unit-I: FLUID PROPERTIES **12 HOURS**

Physical properties of fluids – specific weight, specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion, pressure at a point, classification of fluids, Pascal's law and its practical significance, Hydrostatic law of pressure distribution - atmospheric, absolute, gauge and vacuum pressures - measurement of pressure. Pressure gauges, Manometers – Piezometer, Differential U – tube Manometer and inverted U-tube manometer. Digital Manometers; Application of fluid properties in day to day life.

Unit– II: HYDRO STATICS AND FLUID KINEMATICS13 HOURS

Hydro Statics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Centre of pressure.

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and ir-rotational flows – Equation of continuity for one, two, three dimensional flows – stream function and velocity potential function.Application of hydrostatic in regulation of flow in canals.

Unit-III: FLUID DYNAMICS13 HOURS

Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line from the fundamentals and from Euler's equation – its limitations and applications. Momentum equation and its application – hydraulic analysis of the pipe bend.Application of energy equations in the field.

Unit-IV: MEASUREMENT OF FLOW13 HOURS

Classification of orifices, small orifice and large orifice. Difference between mouthpiece and orifice. Pitot tube, Venturimeter and Orifice meter - flow over rectangular, triangular, trapezoidal and Stepped notches - –Broad crested weirs.Digital flow measuring devices**.**

Unit-V: LAMINAR FLOW AND TURBULENT FLOWS14 HOURS

Reynold's experiment – its practical significance. Characteristics of Laminar & Turbulent flows,

Laws of Fluid friction, Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows. Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Hazen-Williams formula.Conducting field survey for new advanced pipes and their losses (Case Base learning).

Text books:

1. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal – Laxmi Publications (P) ltd., New Delhi Digital Design by Mano, PHI

Reference books:

1. Mechanics of Fluids, Merle C. Potter, David C. Wiggert and Bassem H. Ramadan, CENGAGE Learning.
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford Higher Education

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II-Year-I Semester		L	T	P	C
		2	1	0	3

SURVEYING (20CE3T03)

Course objectives:

The main objectives are

1. To understand the concept of chain surveying, instruments for chaining and the concept of linear measurements.
2. To Know about the compass, angles and bearings. To know the application of compass in the field work. To know the concept of traversing.
3. To find the elevation difference between various points. To know about various methods of levelling. To Know the uses of contour maps and locating the contours.
4. To know how to operate the theodolite. To find the horizontal & vertical angles. To understand the concept of tachometry.
5. To calculate the areas along irregular boundaries and volume of earthwork from various rules. To Know the elements of simple & compound curves. To understand the basic concepts behind the EDM, Total station, GIS & GPS.

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

CO1	Understand the concept of chain surveying, instruments for chaining and the overall concept of linear measurements. (Remembering, Understanding & Applying)
CO2	Know the uses of compass, calculate the angles from bearings. Understand the concept of declination & Local attraction. Application of compass in the field work. Know the Concept of traversing & its applications. (Remembering, Understanding & Applying)
CO3	Find the elevation difference between various points using a level. Understand the concept of various methods of levelling. Know the uses of contour maps in the field and locating the contours. (Remembering, Understanding & Applying)
CO4	Operate the theodolite & find the horizontal & vertical angles. Know the uses of tacheometry & find the distance & elevation of different points (Remembering, Understanding & Applying)
CO5	Calculate the areas along irregular boundaries & area from coordinates. Find the volume of earthwork from various rules. Know the elements of simple & compound curves. Understand the basic concepts behind the EDM, Total station, GIS & GPS. (Remembering, Understanding & Applying)

Unit-I: FUNDAMENTAL CONCEPTS, LINEAR MEASUREMENTS & CHAIN SURVEYING13 HOURS

Introduction: Object, Primary divisions, Classification & Principles of Surveying. Scales- Plane & Diagonal. Error due to use of wrong scale, Shrunk scale.

Chain Surveying: Instruments for chaining, Ranging out survey lines, Error due to incorrect chain, Errors in chaining, Tape corrections.Chain triangulation, Survey stations, Survey lines, Field book, Obstacles in chaining, Cross staff survey**.**

Unit– II: COMPASS SURVEYING & TRAVERSING13 HOURS

Compass Surveying: Introduction, Definitions, Designation of bearings, Types of compass, temporary adjustments of compass, Included angles, Magnetic declination, Dip, Local attraction, Errors in compass survey.

Traversing: Introduction of traversing, Methods of traversing, Closing error, Balancing a traverse.

Unit-III: LEVELLING AND CONTOURING13 HOURS

Levelling: Definitions in levelling, Methods of levelling, levelling instruments, Temporary

adjustments of a level, Principles of levelling, Bookings & Reducing levels, Curvature & Refraction, Errors in Levelling.

Contouring: Introduction of contouring, Definitions, Characteristics of contours, Methods of locating contours, Uses of contour maps.

Unit-IV: THEODOLITE AND TACHEOMETRIC SURVEYING12 HOURS

Theodolite: Introduction of theodolite, Definitions, Temporary adjustments, Measurement of Horizontal angles & Vertical angles. Fundamental lines and desired relations.

Tachometric Surveying: Introduction of tachometry, Methods of tachometry- Fixed hair method, Movable hair method & Tangential method.

Unit-V: CALCULATION OF AREA & VOLUME, CURVES, EDM, TOTAL STATION, GIS & GPS 14 HOURS

Calculation of Area & Volume: Computation of area from offsets area from coordinates. Volume-Measurements from cross sections, Prismoidal formula, Trapezoidal formula. Volume from spot levels & volume from contour plan.

Total Station: Introduction of curves & Classification. Elements of simple & compound curves. Introduction of EDM, Total station, Remote sensing, GIS (Geographic Information System) & GPS (Global Positioning System).

Text books:

1. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, ArunK.Jain, Laxmi Publications.
2. Surveying, Vol. I & II by S. K. Duggal, TataMc-Graw Hill.

Reference books:

1. Surveying and Levelling by N. N. Basak, Tata McGraw Hill.
2. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House.
3. Surveying and Levelling by Subramanian, Oxford University Press.
4. Textbook of Surveying by C. Venkatramaiah , University Press.

e-resources:

- https://nptel.ac.in/courses/105/107/105107122/
- https://nptel.ac.in/courses/105/104/105104101/

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II-Year-I Semester		L	T	P	C
		3	0	0	3

CONCRETE TECHNOLOGY (20CE3T04)

Course objectives:

The main objectives are

1. Identify the physical and chemical properties of concrete ingredients and able to conduct tests on cement and aggregates.
2. Comprehend the workability of concrete, manufacturing processes of concrete and the behavior of fresh, hardened concrete.
3. Gain the knowledge about NDT methods, quality control of concrete and how to conduct the tests on hardened concrete.
4. Identify the properties like elasticity, creep, shrinkage; special concretes and their applications in the diverse construction field.
5. Acquire the practical knowledge on mix design principles, concepts and methods.

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

CO1	Illustrate the physical and chemical properties of concrete ingredients and able to conduct tests on cement and aggregates.
CO2	Clarify the physical properties of fresh and hardened concrete and also about the manufacturing of concrete.
CO3	Estimate the creep and shrinkage of concrete and how to conduct the different tests such as compression and tension on hardened concrete and also summarize the quality control of concrete under different conditions.
CO4	Distinguish the special concretes like Self compacting concrete, Fibre reinforced concrete, Polymer concrete and light weight concrete etc.
CO5	Design the mix proportions for the specific work for required strength and workability with available materials at workplace.

Unit-I: CONCRETE INGREDIENTS & ITS PROPERTIES 14 HOURS

Cements & Admixtures: Portland cement – Chemical composition – Hydration, setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum size of aggregate.

Unit-II: FRESH & HARDENED CONCRETE 13 HOURS

Fresh Concrete: Production of concrete, mixing, compaction curing, Properties of fresh concrete. Workability – Factors affecting workability – Measurement of workability bydifferenttests– Settingtimesofconcrete–Effectoftimeandtemperatureonworkability– Segregation & bleeding.

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.

Unit-III: TESTING AND QUALITY CONTROL OF CONCRETE13 HOURS

Testing of Hardened Concrete: Compression tests–Tension tests–Factors affecting strength – Flexure tests–Splitting tests–Non-destructive testing methods– codal provisions for NDT.

Quality control of Concrete: Behavior of concrete in extreme environment; temperature problem in concreting, hot weather, cold weather and under water conditions, Resistance to freezing, sulphate and acid attack, efflorescence, fire resistance; Inspection and testing of concrete-Concrete cracking, types of cracks, causes and remedies.

Unit-IV: PHYSICAL PROPERTIES OF CONCRETE AND SPECIAL CONCRETES

15 HOURS

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.

Special concretes: Light weight aggregates – Lightweight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Different types of fibres– Factors affecting properties & Applications of F.R.C – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete & Applications – High performance concrete – Self consolidating concrete – SIFCON.

Unit-V: MIX DESIGN10 HOURS

Factors in the choice of mix proportions – Durability of concrete– Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

Text books:

1. Concrete Technology by M. S. Shetty – S. Chand & Co. ;2004
2. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
3. Concrete Technology by M.L. Gambhir – Tata Mc. Graw Hill Publishers, NewDelhi

Reference books:

1. Concrete Technology by A.R. Santha Kumar, Oxford University Press, NewDelhi.
2. Concrete Technology by A.R. Santha Kumar, Edition-2013, Oxford University Press, New Delhi.
3. Design of Concrete Mixes by N.Krishnam Raju,2nd edition,CBS Publishers & Distributors
4. Concrete: Microstructure, Properties and materials by P Kumar Mehta, P J M Monteiro, MC Graw Hill Education Publisher, New Delhi.
5. Concrete Technology by R.S. Varshney, Oxford and IBH.

Code Books:

- IS10262: 2019 Guidelines for concrete mix design proportioning
- IS 456: 2000 Plain and Reinforced Concrete - Code of Practice

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II-Year-I Semester		L	T	P	C
		0	0	3	1.5
STRENGTH OF MATERIALS LAB (20CE3L01)					

Course objectives:
The main objectives are

1. Providing hands on practice on material behavior subjected to tensile, compressive, torsion and shear loadings.
2. The course also deals with material hardness and impact resistance.

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

CO1	Perform necessary experiments to determine the mechanical properties of materials under different loading conditions
CO2	Analyze the experimental results for assessment of the strength of the given material.

List of Experiments

1. Study of stress-strain characteristics of Mild steel/HYSD bars by UTM.
2. Determination of modulus of elasticity of the material of the beam by conducting bending test on simply supported beam.
3. Determination of modulus of elasticity of the material of the beam by conducting bending test on Cantilever beam..
4. Verification of Maxwell's Reciprocal theorem on beams.
5. Determination of modulus of elasticity of the material of the beam by conducting bending test on simply supported beam with one end overhang.
6. Determination of modulus of rigidity by conducting torsion test on solid circular shaft.
7. Determination of hardness of the given material by Brinnel's/Vicker's/ test
8. Determination of hardness of the given material by Rockwell hardness test.
9. Determination of impact strength of the given material by conducting Charpy/Izod test
10. Determination of ultimate shear strength of steel by conducting direct shear test.
11. Determination of modulus of rigidity of the material of closely coiled helical spring.
12. Determination of compressive strength of wood/ concrete cube/ brick/ with grain parallel / perpendicular to loading.

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II-Year-I Semester		L	T	P	C
		0	0	3	1.5

SURVEYING FIELD WORK (20CE3L02)

Course objectives:

- To know about various surveying instruments & their applications in the field.

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

CO1	Do plane surveying with chain, compass & plane table.
CO2	Do levelling & contouring.
CO3	Operate the theodolite & tachometer in the field applications.
CO4	Setting out simple curve.

List of Experiments

1. Survey of an area by Chain surveying using chain & cross staff.
2. Chaining across obstacles.
3. Determination of distance between two inaccessible points using prismatic compass.
4. Radiation & intersection methods by Plane table.
5. Differential levelling using auto level.
6. Contouring by Indirect method.
7. Measurement of horizontal & vertical angles using theodolite.
8. Trigonometric levelling: Base is accessible & inaccessible conditions.
9. Determination of Tachometric constants- Field procedure.
10. Determination of elevation & horizontal distance of a point using tachometer.
11. Setting out simple curve.

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II-Year-I Semester		L	T	P	C
		0	0	3	1.5

CONCRETE TECHNOLOGY LAB (20CE3L03)

Course objectives:

The main objective is

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

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

CO1	Able to conduct experiment and determine the various Laboratory tests on cement
CO2	Able to conduct experiment and determine the properties of fine and course aggregate
CO3	Able to conduct experiment and determine the properties of fresh concrete
CO4	Able to conduct experiment and determine the properties of Hardened concrete

List of Experiments**At least 10 Experiments must be conducted**

Tests on Cement

1. Determination of specific gravity of cement.
2. Determination of fineness of cement By dry sieving
3. Determination of normal Consistency of Cement
4. Determination of initial and final setting time of cement.
5. Determination of compressive strength of cement.
6. Determination of soundness of cement.
7. Determination of fineness of cement by air permeability method.

Tests on Aggregate

8. Determination of specific gravity of fine aggregate and coarse aggregate
9. Determination of grading and fineness modulus of fine aggregate and coarse aggregate by sieve analysis.
10. Determination of bulking of sand.

Tests on fresh Concrete

11. Determination of workability of concrete by slump test
12. Determination of workability of concrete by compaction factor method.
13. Determination of workability of concrete by Vee-bee consistency test.

Tests on hardened Concrete

14. Determination of compressive strength of concrete
15. Determination of split tensile strength of concrete.
16. Determination of young's modulus of concrete. (Demonstration)
17. Non-Destructive testing on concrete using rebound hammer

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II-Year-I Semester		L	T	P	C
		0	0	4	2
ADVANCED AUTO CAD (20CE3C01)					

Course objectives:
The main objective is

1. To develop skills to use AUTOCAD Software to create 2D Drawings and 3D Models.

Course Outcomes:
The student will be able to

1. Will be able to use the draw and modify commands in Auto CAD to create 2D and 3D wire Frame modelling.
2. Will be able to use the different view ports option in the Auto CAD software.
3. Will be able to draw plan, section and elevation for various types of buildings as per the Indian standards.

List of Experiments

1. Symbols for various materials used
2. King post truss
3. Queen Post truss
4. English bond
5. Flemish Bond
6. Dog Legged Staircase
7. Double Panel Door and their parts
8. Window and their parts
9. Plotting a site using chain surveying field book.
10. Finding the area of the given boundary using compass (Closed Traverse).
11. Plotting Road profile (Longitudinal section and cross section)
12. Isometric Drawings in 3D for simple figures
13. Learning Different Operations like Threading, Sweep, Loft
14. Preparation of map using total station coordinates

Note:

Student is required to complete minimum of 12 drawings

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II-Year-I Semester		L	T	P	C
		2	0	0	0

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (20SH3N01)

Course objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

1. The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
2. To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003.
3. The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection.
4. To know the student traditional knowledge in different sector.

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

CO1	understand the concept of Traditional knowledge and its importance
CO2	Know the need and importance of protecting traditional knowledge.
CO3	Understand legal framework of TK, Contrast and compare the ST and other traditional forest dwellers
CO4	Know the various enactments related to the protection of traditional knowledge.
CO5	Understand the concepts of Intellectual property to protect the traditional knowledge

UNIT – I: Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge.
UNIT – II: Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.
UNIT – III: Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.
UNIT – IV: Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.
UNIT – V: Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TEXT BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

e- Resources & other digital material:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

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II-Year-II Semester		L	T	P	C
		2	1	0	3

SCIENTIFIC COMPUTING USING PYTHON (20CS4T04)

Pre-Requisites: Engineering Mathematics

Course objectives:

1. To understand basic operations in Python
2. To apply use if-else statements and switch-case statements to write programs in Python to tackle any decision-making scenario
3. To Perform, Store and retrieve information using Data structures
4. To Understand Use of python libraries for problem solving
5. To create graphical form representation for computed data.

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

CO1	Understand basic operations in Python {Understand level, KL2}
CO2	Apply use if-else statements and switch-case statements to write programs in Python to tackle any decision-making scenario {Apply, KL3}
CO3	Perform, Store and retrieve information using Data structures {analyse, KL4}
CO4	Understand Use of python libraries for problem solving. {Understand level, KL2}
CO5	Create graphical form representation for computed data. {Create, KL6}

Unit–1: INTRODUCTION AND DATA TYPES 13 HOURS

Introduction: History of Python, Need of Python Programming, Applications of python, Running Python Scripts, Variables, Assignment, Keywords and Identifiers, Input-Output, Indentation.

Data Types: Integers, Floats, Complex Numbers, Strings, Booleans; Type Conversion.

Unit–2: OPERATORS AND CONTROL FLOW12 HOURS

Operators: Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations

Control Flow: Boolean Expression, if, if-else, for, while, break, continue, pass.

Unit–3: DATA STRUCTURES AND FUNCTIONS13 HOURS

Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences and Comprehensions.

Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Recursive and Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Unit–4: MODULES, PYTHON PACKAGES, LIBRARIES14 HOURS

Modules: Creating modules, import statement, from.

Math Module: Constants, Power and logarithmic functions, Trigonometric functions, Angular

conversion, Hyperbolic functions.

Python package: Introduction to PIP, Installing Packages via PIP, Using Python Packages.

Popular libraries: Introduction and applications of popular libraries: Scipy, Numpy, Sympy, Matplotlib, and Pandas

Numpy Library: Numpy import, Basic functions, Matrices Addition, Subtraction, Multiplication, Transpose, Inverse, Eigen values and Eigenvectors using Numpy.

Unit–5:DATA VISUALIZATION **13 HOURS**

Matplotlib: Loading the library and importing the data, How Mat plot lib works, different types of plots: line plots, Scatter plots, Bar plots, contour plot modifying the appearance of a plot, plotting multiple plots, Modifying the tick marks, axes labelling.

Scipy: Interpolation and Numerical Integrations Using Scipy

Text books:

1. Python for civil and structural engineers by Vittorio Lora.
2. Scientific Computing In Python By Abhijit Kar Gupta. TECHNO WORLD PUB

Reference books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Numerical Python: Scientific Computing and Data Science Applications by Robert Johansson.
3. Let Us Python by Yashavant Kanetka

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II-Year-II Semester		L	T	P	C
		2	1	0	3

TRANSPORTATION ENG INEERING (20CE4T01)

Course objectives:
The student should be able to

1. To impart knowledge on history of road development in India, Highway alignment and design of road geometric elements
2. To learn various traffic surveys and their use in designing various road elements
3. To describe tests related to quality of materials and learn various highway construction and maintenance procedures.
4. To acquire design principles of Highway Geometrics and Pavements
5. To know various components and their functions in a railway track and to acquire design principles of geometrics in a railway track

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

CO1	Plan highway network for a given area and design highway geometrics (**Understand & Apply)**
CO2	Design Intersections and prepare traffic management plans (**Understand, Apply & Create**)
CO3	Judge the suitability of pavement materials in road construction and able to construct and maintainhighways (**Understand & Evaluate**)
CO4	Design flexible and rigid pavements (**Create**)
CO5	Plan, design and maintain railway track and its elements **(Understand & Create)**

Unit–1: 13 HOURS

Highway Development and Planning: Highway development in India, Highway planning, Different road development plans, Classification of roads, Road network patterns, Highway alignment – Factors affecting

Highway Geometric Design: Importance of geometric design, Highway cross sectional elements, Sight distance elements, Design of horizontal Alignment - Design of super elevation and extra widening; Design of transition curves, Design of vertical alignment, Gradients, Vertical curves.

Unit–2:14 HOURS

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

Unit–3: 14 HOURS

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

Highway Construction And Maintenance: Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements. Pavement Failures, Maintenance of Highways, pavement evaluation

Unit–4: 12 HOURS

Pavement Design : Pavements – Types, Functions and components; Design factors, Flexible pavement design methods, Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method

Unit–5:12 HOURS

Introduction To Railway Engineering: Permanent way – Components and their functions – Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints

Track Geometric Design – Alignment – Engineering Surveys - Gradients- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves

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, New Delhi
3. Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi

Reference books:

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
2. Highway, Railway, Airport and Harbor Engineering, Subramanian K. P, Scitech Publications (India) Pvt Limited, Chennai

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II-Year-II Semester		L	T	P	C
		2	1	0	3

STRUCTURAL ANALYSIS (20CE4T02)

Pre-Requisites: Strength of Materials

Course objectives:

1. Familiarize student with statically determinate and indeterminate structures
2. To analyze fixed beams and propped cantilever beams
3. Enable students to analyze beams and frames by application of slope and deflection methods
4. Equip student with quick and approximate analysis of building frames for gravity and lateral Loads
5. Enable students to determine deflections of beams, frames and trusses by application of Energy Methods.
6. To analyze the variation of force in beams & trusses and draw influence line diagram
7. Introduce basic concepts of matrix analysis

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

CO1	Distinguish between statically determinate and indeterminate structures
CO2	Analyze fixed beam and propped cantilever beam
CO3	Analyze continuous beam and frames by application of slope-deflection and moment distribution methods. Apply approximate methods and determine the structural response of building frames subjected to gravity loads and lateral loads respectively
CO4	To find deflections in simple structures by application of energy method and plot the influence diagram for variation of force quantity in beams and trusses
CO5	Carry out matrix analysis of continuous beams

Unit–1: 14 HOURS

Introduction: Structure, Load, Response,Static indeterminacy and structural integrity (stable / unstable) of beams - trusses - frames, Limitations of formulas – effect of support reactions and improper constraints, Kinematic indeterminacy, Internal forces in statically determinate simple beams, cantilever and simply supported frames

Analysis of Propped Cantilever and Fixed Beams: Analysis of Propped Cantilever beams – SFD, BMD and deflection (Elastic curve), Analysis of Fixed beams – SFD, BMD and deflection (Elastic curve)

Unit–2:12 HOURS

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports - SFD and BMD.

Moment Distribution Method: Member flexural stiffness, Carry over factor**,** Distribution factor,Application to continuous beams with and without settlement of supports. Analysis of Single bay single storey portal frames without sway and with sway – SFD and BMD.

Unit–3: 13 HOURS

Gravity Load Analysis Using Approximate Methods: Analysis of continuous beams and portal frames using Inflection Points, Analysis of building frames using Substitute Frame Method

Lateral Load Analysis Using Approximate Methods: Application to building frames. (i) Portal Method (ii) Cantilever Method.

Unit–4:14 HOURS

Deflections using Energy Methods: Introduction-Strain energy in linear elastic system, expression of strainenergy due to axial load - bending moment - shear forces, Application of Castigliano's theorems-Deflections of statically determinate trusses and frames.

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

Unit–5:Introduction to Matrix Methods (System Approach): 12 HOURS

Flexibility method: 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. C.S. Reddy, Basic Structural Analysis, Tata McGraw-Hill
2. R. C. Hibbeler, Structural Analysis, Pearson Education
3. K. U. Muthu et al., Structural Analysis – Vol I & II, IK International

Reference books:

1. Devdas Menon, Structural Analysis, Narosa Publishers
2. T. S. Thandavamoorthy, Structural Analysis, OUP, India
3. S. S. Bhavikatti, Structural Analysis Vol I & II, Vikas Publications
4. V. N. Vazirani , M. M. Ratwani and S. K. Duggal, Analysis of Structures- Vol. I and II, Khanna Publishers, NewDelhi
5. G. S. Pandit and Gupta, Matrix Analysis of Structures, Tata McGraw-Hill
6. Structural Analysis I and II, IIT Kharagpur, NPTEL web course material

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II-Year-II Semester		L	T	P	C
		2	1	0	3

HYDRAULICS AND HYDRAULIC MACHINERY (20CE4T03)

Pre-Requisites: Fluid Mechanics

Course objectives:

The student should be able to

1. To understand the fundamental concepts of open channel uniform flow and Non-uniform flow conditions.
2. To study the concept of boundary layer control and its practical applications.
3. To understand the need of relationship between model and prototype and able to predict the prototype behavior based on the field conditions
4. To predict the influence of hydrodynamic forces acting on vanes at different conditions.
5. To understand the working mechanism and performance characteristics of a turbine.
6. To understand the working mechanism and performance characteristics of a pump.

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

CO1	Able to Design of an economical open channel section and estimate the energy profile of the flow in the channel.
CO2	Able to apply concept of boundary layer in operation and design of moving vehicles
CO3	Able to establish relationship among the variables in any natural phenomena and predict design parameters of the prototype using similitude.
CO4	Able to predict the type of material, size and shape of vanes using the analysis of impact of jet.
CO5	Able to configure various components of turbines, pumps and their installation.

Unit–1: FLOW IN OPEN CHANNELS **14 HOURS**

Uniform Flow in Open Channels: Types of channels –Types of flows – Velocity and pressure distribution – Chezy's, and Manning's formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth.

Non-Uniform Flow in Open Channels: Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

Unit–2:BOUNDARY LAYER THEORY12 HOURS

Boundary layer (BL) – concepts, Characteristics of boundary layer along a thin flat plate - laminar and turbulent Boundary layer, separation of BL, Control of BL, flow around submerged Objects-Drag and Lift- Magnus effect.

Unit–3: HYDRAULIC SIMILITUDE12 HOURS

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

Unit–4:HYDRAULIC TURBINES **14 HOURS**

Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency - Angular momentum principle.

Hydraulic Turbines: Classification of turbines. Pelton wheel - Francis turbine – Kaplan turbine - working, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Units and specific quantities, performance characteristics curves of the turbine.

Unit–5:PUMPS **13 HOURS**

Centrifugal Pumps: Classification, different heads and efficiencies, work done - Manometric head-minimum starting speed of the pump-specific speed, performance characteristics curves of pumps.

Reciprocating Pumps: Classification, working principle, work done, indicator diagram and slip

Text books:

1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers
2. A text of Fluid mechanics and hydraulic machines, Rajput
3. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi

Reference books:

1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford Higher Education.
3. A text of Fluid mechanics and hydraulic machines, R. K. Bansal – Laxmi Publications (P) ltd., New Delhi Digital Design by Mano, PHI
4. Mechanics of Fluids, Merle C. Potter, David C. Wiggert and Bassem H. Ramadan, CENGAGE Learning.

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II-Year-II Semester		L	T	P	C
		2	1	0	3

ENVIRONMENTAL ENGINEERING (20CE4T04)

Pre-Requisites: Chemistry, Environmental Science, Fluid Mechanics, Hydraulics & Hydraulic Machinery.

Course objectives:
The course deals with concepts of water demand and water quality parameters, design of water treatment units, sewage quality parameters, sewage treatment units, sludge handling in sewage treatment.

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

CO1	**Assess** the quality and quantity of water requirements for a city
CO2	**Design** of different treatment units and distribution systems for water supply
CO3	**Analyze** the characteristics, collection, conveyance and disposal of waste water
CO4	**Design** of sewers and various units in a waste water treatment plant
CO5	**Design** of secondary and biological treatment units

Unit–1: WATERDEMANDS-STANDARDS-SOURCES: 13 HOURS

Aspects of Environmental Engineering – Protected water supply – Need – Water demands – Fluctuations – Design period-Population forecast – Water quality – Drinking water standards-Testing and significance – Quality and Quantity and other considerations of surface and sub-surface sources – Yield calculations – Intake works – Storage reservoir capacity – Systems ofwatersupply– Requirements–Detectionofleakages–Selectionofpump–Economicaldiameterofpumpingmain.

Unit–2: TREATMENTOFWATERANDDISTRIBUTION: 13 HOURS

Watertreatment,conventionaltreatmentflowdiagram–Sedimentationtypes–Principles–Design factors– Coagulation –Design of Clariflocculator –Filtration–Slow,RapidgravityfiltersandPressurefilters– Designprinciples-Disinfection–TheoryofChlorination–Distribution systems– Layouts – Design- and analysis, Hardy Cross method and Equivalent Pipemethod. Valves–Other appurtenances.

Unit–3: WASTEWATERMANAGEMENT: 13 HOURS

Introduction:Wastewatertreatmentsystem–Definitionsofterms–Collectionandconveyanceofsewage– Sewageflowrates–Stormwater–Characteristicsofsewage–Cyclesofdecay–BOD–COD– Ultimatedisposalofsewage–self-purificationofrivers–sewage farming

Unit–4: DESIGNOFSEWERSANDPRIMARYTREATMENT: 13 HOURS

Layouts – Design of sewers – Sewers appurtenances – Sewage pumping -Conventional sewagetreatment–Primarytreatment:-Screens–Gritchamber–Sedimentationtanks– Designprinciples.SeptictanksandImhofftanks-rurallatrines–Houseplumbing–Appurtenances.

Unit–5:SECONDARYBIOLOGICALTREATMENT:13 HOURS

Secondary treatment – Biological treatment – Trickling filters – Activated Sludge Process – Lowcost waste treatment methods – Design of Oxidation ponds – Aerobic and Anaerobic lagoons.Sludge Digestion–Design principles–Disposal.

Text books:

1. B.C.PunmiaBC,A.K.JainandA.K.Jain,"WaterSupplyEngineering",LaxmiPublications.2nd Edition1995, Reprint 2005.
2. B.C.Punmia,A.K.JainandA.K.Jain,"WastewaterEngineering",LaxmiPublications,2ndEdition1998, Reprint 2014.

Reference books:

1. S.K.Garg,"WaterSupplyEngineering",KhannaPublishers,26threvisedEdition,NewDelhi.2010.
2. S.K. Garg, "Sewage disposal and Air Pollution Enginering", Khanna Publishers New Delhi. 36thEdition, 2017.
3. H.S.Peavy,D.Rowe,andG.Tchobanoglous,"EnvironmentalEngineering",McGrawHillPublishers,New Delhi. 1985.
4. G.S.BirdieandJ.S.Birdie,"WaterSupplyandSanitaryEngineering"DhanpatRaiPublishingCompanyNew Delhi, 6thEdition, 2002.
5. K.N.Duggal,"ElementsofEnvironmentalEngineering",S.Chand&CompanyLimited,NewDelhi, 2007.
6. P.N.Modi,"SewageTreatmentDisposal&WastewaterEngineering",StandardBookHouse,2016.
7. Manualonsewerageandsewagetreatment,CPHEEO,Ministryofurbanaffairsandemployment,Govt. ofIndia, New Delhi, 2001
8. WaterandWastewaterEngineering,NPTELvideolecturesand webnotes

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II-Year-II Semester		L	T	P	C
		0	0	3	1.5
SCIENTIFIC COMPUTING PYTHON LAB (20CS4L04)					

Course objectives:

1. To understand basic operations in Python
2. To apply use if-else statements and switch-case statements
3. To write programs in Python
4. To tackle any decision-making scenario.

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

CO1	Perform necessary experiments to det Understand basic oprations in Python.
CO2	**Apply** use if-else statements and switch-case statements to write programs in Python to tackle any decision-making scenario.
CO3	**Perform**, Store and retrieve information using Data structures.
CO4	**Understand** Use of python libraries for problem solving.
CO5	**Create** graphical form representation for computed data.

List of Experiments:

Section 1

Exercise 1 – Input and Output

a) Write a Python program which accepts the user's first and last name and print them in reverse order with a space between them.

b) Write a Program which takes input for a variable and returns its type.

c) Write a Python program to get the Python version you are using.

Exercise 2 - Operations

a) Write a Python program that will accept the base and height of a triangle and compute the area.

b) Write a program to compute distance between two points coordinates taking (x1, y1) and (x2, y2) input from the user (Pythagorean Theorem)

c) Write a program to convert length in m to Ft-in

Section 2

Exercise - 3 Control Flow: If-Else

a) Write a Program for checking whether the given number is an Even or Odd.

b) Write a program to convert angles bearings) in Whole circle bearing (WCB) system to Reduced Bearing (RB) system.

c) Write a Python program to convert temperatures to and from Celsius, Fahrenheit. Or vice versa.

Exercise 4 - Control Flow – For, while

a) Python Program to Find the Sum of first N Natural Numbers

b) Python Program to Display the multiplication Table

c) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Section 3

Exercise - 5 - DS

a) write a Program to Illustrate Different List Operations

b) Find mean and standard deviation for the given set of numbers in a list.

c) write a Program to Illustrate Different Tuples Operations

Exercise - 6 DS - Continued

a) Python Program to Illustrate Different Set Operations

b) Python Program to Illustrate Different Dictionaries Operations

Exercise - 7 Functions

a) Python Program to Make a Simple Calculator using functions
b) Write a function to compute and return area of triangle with user give three sides.
c) Write a program to find the sum of natural using recursive function

Section 4

Exercise - 8 - Modules

a) Define all functions used in Exercise 7 create as module and save it as "functions.py".
b) Execute all the operations performed in Exercise 7 by importing above module "functions.py" without defining any function.
c) Install any package using (pip) and list all the available functions using dir() function.

Exercise 9 - Math Module

a) write a Program to Illustrate Different Constants, Power and logarithmic, Angular conversion functions in math module
b) write a Program to Illustrate Different Trigonometric and Hyperbolic functions in math module

Exercise 10 - Numpy

a) Write a program that defines a matrix and prints using Numpy.
b) Write a program to perform Addition, Subtraction, Multiplication of two square matrices of same size using Numpy.
c) Write a program to perform Transpose, Inverse, Eigen values and Eigenvectors of a 5x5 matrix using Numpy.

Section 5

Exercise 11 – Matplotlib

a) Write a Program to Draw bending moment and shear force diagram of a cantilever with point load at end.
b) Write a Program to Draw bending moment and shear force diagram of a simply supported beam with UDL.

Exercise 12 - Scipy

a) Write a program to find numerical integration of a given equation and range [a,b] using Scipy.
b) Write a program to perform 1D linear interpolation between two numbers using Scipy.

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II-Year-II Semester		L	T	P	C
		0	0	3	1.5

BUILDING PLANNING AND DRAWING (20CE4L01)

Pre-Requisites: AutoCAD Basics

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 sign conventions and different building units.
4. Imparting the skills and methods of planning of various buildings.

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

CO1	Able to plan various buildings as per the building by-laws.
CO2	Able to distinguish the relation between the plan, elevation and cross section and identify the form and functions among the buildings.
CO3	Expected to learn the skills of drawing building elements and plan the buildings as per requirements.

List of Experiments

1. History of Indian Architecture
2. Overview of NBC- 2016 and Building Bye Laws
3. Principles of Planning of a Residential building, Orientation of building and Minimum standards for various parts of Residential Building with respect to AP GO No: 168
4. Principles of Planning of Commercial buildings and Minimum standards for various parts of Commercial Buildings with respect to AP GO No: 168
5. Prepare a line diagram of 2BHK for the given site according Go No: 168
6. Prepare a line diagram of 3BHK for the given site according Go No: 168
7. Overview of IS 962-1989 and Software's used for 2D and 3D drawings
8. Draw the Sign conventions of Building, Electrical and Plumbing
9. Draw any given Field Measurement book sketch
10. Draw the Plan, Section and Elevation of a two bed room house
11. Draw the Plan, section and Elevation of a MIG house
12. Draw the Plan, Section and Elevation of an Educational building
13. Plan, Section and Elevation of a Hotel/Motel building
14. Plan, Section and Elevation of a Hospitals/Dispensaries building
15. Draw the plan of a given Layout
16. Draw a detailing Diagram of RCC Beam & Column
17. Draw a detailing diagram of RCC Slab and Isolated foundation

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II-Year-II Semester		L	T	P	C
		0	0	3	1.5
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB (20CE4L02)					

Pre Requisites: Fluid Mechanics, Hydraulics and Hydraulic Machinery

Course Objectives:

- To impart practical exposure to use various flow measuring devices for making engineering judgments.
- To provide practice in estimating friction losses.
- To impart training to use various hydraulic turbines and pumps.

Course Outcomes: After Successful completion of course the student can able to

CO1	Calibrate flow measurement devices like Venturimeter and orifice meter, etc...
CO2	Estimate the friction and measure the frictional losses in fluid flow.
CO3	Compute the performance of various hydraulic turbines and pumps

List of Experiments

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

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II-Year-II Semester		L	T	P	C
		0	0	4	2
DIGITAL LAND SURVEYING (20CE4C01)					

Course objectives:

To practice various advanced digital surveying instruments & mapping techniques.

Course Outcomes: After Successful completion of course the student can able to

1. Understand the concepts of EDM, and calculate the distance, area of the field.

2. Locate the position of points using stake out method, perform the curve using modern equipment.

3. Accurately measure and record coordinates of control points in relation to a base station using Total Station technology.

4. Apply Total Station skills to stake out a single bedroom plan on the ground accurately, translating design plans into physical locations.

List of Experiments

1. Basics of Instrument setup of Total station.pr
2. Measuring coordinates of control points with respect to base station using Total Station.
3. Measurement of distance between two points using Total station (with single station point).
4. Area measurement using Total station (with single station point).
5. Verification of Total station, station shifting with back sighting.
6. Measurement of distance between two points using Total station (with minimum 3 station point shiftings)
7. Area measurement using Total station (with minimum 3 station point shiftings).
8. Measurement of various features of given area using total station.
9. Exporting measured survey points coordinates data to .csv file format
10. Importing 2-Dimentinal and 3-Dimentinal points coordinates data in .csv file format to AutoCADDrawing
11. Exporting Point Data in .CSV file to Total station.
12. Stake out of a single bedroom plan on ground using total station.
13. Preparation of Contour map of a given area using Total Station and relative software.
14. Finding of GPS coordinates of Give point with an accuracy upto 3m.
15. Measurement of area using GPS (minimum area of 10acres).
16. Introduction to photogrammetric surveying, using Drones
17. Flight planning and data collection using an autonomous Drone.
18. Processing of photogrammetric data and preparation of Orthomosaic Map and 3D model.

III-Year-I Semester		L	T	P	C
		3	0	0	3
ENGINEERING ECONOMICS AND MANAGEMENT (20SH5T01)					

PRE-REQUISITES: 1) Basic Sciences and Humanities

Course objectives: The student should be able to

CO 1: To understand the concept and nature of Economics and Demand and to familiarize about the Production function, Input Output relationship, Cost-Output relationship and Break Even Analysis.

CO 2: To understand the nature of markets and the concepts of Money and RBI functions.

CO 3: To familiarize with the process of management, principles, and to provide conceptual knowledge on functional management that is on Human resource management and Marketing management.

CO 4: To learn different Accounting Systems, preparation of Financial Statement and to familiarize with the tools of project Management.

CO 5: To understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	1. The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product and Input-Output-Cost relationships.
CO2	2. The Learner is also ready to understand the nature of different markets and also to have the knowledge of Money & Banking.
CO3	3. The Learner will acquire the knowledge on management, HRM and Marketing.
CO4	4. The Learner will acquire the knowledge to prepare Financial Statements and the techniques of project management.
CO5	5. The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

Syllabus

Unit No	Contents	Mapped CO
I	**Introduction to Economics and Theory of Production**	**CO1**

	13 Hrs Introduction to Economics; Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics – Concept of Demand, Types of Demand, Determinants of Demand-Law of Demand -Elasticity of Demand, Types of Elasticity of Demand. Theory of production; production function, Law of variable proportions & law of returns to scale, Cost; meaning, short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, simple problems.	
II	**Introduction to Markets and Money** Markets: meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly). National Income, GNP, GDP, NNP, NDP, Personal income and GST (Goods & Service Tax). Money: meaning, functions, types, Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools, Banking; meaning, types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR.	**CO2**
III	**Introduction to Management**	**CO3**

	12 Hrs Concept –nature and importance of Management Functions of Management, Principles of Management. Human Resource Management: Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management. Marketing Management: Functions of Marketing - Marketing strategies based on product Life Cycle, Channels of distributions.	
IV	**Introduction to Accounting & Project Management** Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements. Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path (Simple Problems).	**CO4**
V	**Capital and Capital Budgeting:** **12 Hrs** Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money-Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of	**CO5**

	return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index).	

Content Beyond the syllabus:

Introduction to Managerial Economics and demand Analysis: Managerial Economics, Nature & Scope, Demand forecasting for new products, Concept of supply**.**

Theory of Production and Cost Analysis: Production Process, Types of production, ISO- Quants, ISO Costs.

Introduction to Markets and Money: Price Output determination, Pricing Methods and Stock Market and inflation influence on industry.

Introduction to Management: Evolution of Management thought, theories of Motivation, Leadership styles.

Project Management: Brief about Project crashing.

Learning Resources

Text books:

1. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2018, 2e.
2. Dr. N. Appa Rao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2012.
3. Management Science, Aryasri, Tata McGraw Hill, 2014.
4. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, 'Introduction to *Management Science'* Cengage, Delhi, 2012.
5. Engineering Economy and Management 1 Edition Pravin Kumar – Wiley Publication.
6. Engineering Economics & Management- Dr. Vilas Kulkarni & HardikBavishi - Vikas Publishing.

Reference books:

1. R. L Varshney, K.L. Maheshwari : Managerial Economics, Sultan Chand&Sons 2014,22e.
2. Suma Damodaran : Managerial Economics, Oxford 2010,2e.
3. Ambrish Gupta: 'Financial Accounting for Management', Pearson 2015,5e.
4. Dr. S.N. Maheswari: Financial Accounting, Vikas Publications 2018.
5. S. A. Siddiqui & A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2017.
6. Principles of Marketing: A South Asian Perspective, Kotler Philip, Gary Armstrong, Prafulla Y.

Agnihotri, and Eshan ul Haque , 17th Edition, Pearson Education/ Prentice Hall of India, 2018.

7. Human Resource Management: Gary Dessler, 14th Edition, pearson 2015.
8. Project Planning and Control with PERT and CPM: Dr. B. C. Punmia, K. K Khandelwal, Laxmi Publication, 2017, 4th Edition.

e- Resources & other digital material

1. **www.managementstudyguide.com**
2. **www.tutorialspoint.com**
3. **www.lecturenotes.in**

III-Year-I Semester		L	T	P	C
		2	1	0	3
SOIL MECHANICS (20CE5T01)					

Course Objectives:

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

Course Outcomes:

The students will be able to

CO1: ***Classify*** -soil and their engineering properties (Understanding)

CO2:***Explain***-the importance of permeability, seepage and its effects (Understanding, Applying)

CO3: ***Calculate*** -the stresses in soils under external loads (Analysing, Evaluating)

CO4: ***Analysis***- settlement behaviour of soils under compaction and consolidation (Analysing, Evaluating)

CO5: ***Explain***- the failure mechanism under the influence of different loading and drainage conditions (Understanding)

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT-I

INTRODUCTION AND INDEX PROPERTIES OF SOILS 10 HOURS

Soil formation– Soil structure and clay mineralogy, Adsorbed water, Mass- Volume relationships – Relative density. Grain size analysis– Sieve and Hydrometer methods – Consistency limits and indices– IS Classification of soils.

UNIT– II

PERMEABILITY & SEEPAGE THROUGH SOILS 12 HOURS

Soil water – Capillary rise – Flow of water through soils – Darcy's Law- Permeability – Factors affecting permeability, Capillary phenomenon in soils – Laboratory determination of coefficient of permeability – Permeability of layered systems. Total, neutral and effective stresses – Quick sand condition – Seepage through soils –Flow nets: Construction, Characteristics and Uses.

UNIT-III

STRESS DISTRIBUTION IN SOILS 12 HOURS

Boussinesq's and Westergaard's theories for point loads and areas of different shapes – Newmark's influence chart.

UNIT-IV

COMPACTION & CONSOLIDATION **13 HOURS**

Mechanism of compaction – Factors affecting compaction– Effects of compaction on soil properties – Field compaction Equipment –compaction control. Stress history of clay; Compressibility of soils, Terzaghi's one dimensional consolidation theory, Consolidation test, pre-consolidation pressure, e - p and e-log p curves, total settlement.

UNIT-V

SHEAR STRENGTH OF SOILS **13 HOURS**

Mohr – Coulomb failure theories – Types of laboratory strength tests– Strength tests based on drainage conditions – Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays, pore pressure coefficients.

TEXT BOOKS:

1. Arora. K.R., "Soil Mechanics and Foundation Engineering", 5th Edition, Standard Publishers and Distributors, 2001.
2. Gopal Ranjan, Rao A.S.R., "Basic and Applied Soil Mechanics", 2nd Edition, New Age Intl. (P) Ltd., 2005.

REFERENCES:

1. Das. B.M., "Principles of Geotechnical Engineering", 7th Edition, Cengage Learning, 2010.
2. Murthy V. N. S., "Textbook of Soil Mechanics and Foundation Engineering", 1st Edition,
3. CBS Publishers, 2018.
4. Venkataramiah. C., "Geotechnical Engineering", 3rd Edition. New Age International Pvt. Ltd, 2008.

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III-Year-I Semester		L	T	P	C
		2	1	0	3
DESIGN AND DRAWING OF CONCRETE STRUCTURES (20CE5T02)					

Course Objectives:

1. To impart basic concepts of design of individual components of the reinforced concrete structures using limit state and working stress method.
2. To impart concepts of limit state design and serviceability checks for different components of RCC structures using the Indian standard codes with different loading conditions and to sketch the reinforcement details of designed structure.
3. To understand the principles of singly reinforced beams and doubly reinforced beams.
4. To enable the students to design of Important RCC structures like beams, slabs, and columns and footings.
5. For the given loads, impart the students to design according to IS codes.

Course Outcomes:

The students will be able to

CO1: ***Understand*** the fundamental behaviour of RCC structures and code provisions of IS 456:2000 and IS 875.

CO2: ***Analyse*** the different types of beams subjected to different loading conditions and understand the variation of moment of resistance (Understanding, Analysing)

CO3: ***Apply*** the IS code provisions for design of sections and determining the reinforcement detailing satisfying the given loading conditions (Applying, Analysing)

CO4: ***Design*** of slabs, columns and footings for given loading conditions (Designing)

CO5: ***Drawing*** the reinforcement detailing of beams, columns and footings and slabs for obtained data in design. (Analysing, drawing)

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Designing, 6 - Drawing

Unit-I: INTRODUCTION TO DESIGN METHODS 10 HOURS

Working stress method: Introduction- loading standards – Dead, live, wind and earthquake loads, Elastic theory: design constants, modular ratio, neutral axis depth and moment of resistance for balanced, under-reinforced and over-reinforced sections. – Design for bending –analysis and design of singlyreinforced and doubly reinforced beams.

Limit state method: Concepts of limit state design – Characteristic loads –Characteristic strength – Partial load and safety factors – Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

Unit– II: DESIGN OF BEAMS 13 HOURS

Beams: Design of singly and doubly reinforced beams-effective depth-Moment of Resistance-Minimum depth and minimum tension reinforcement- Design examples of simply supported and cantilever beams.

Flanged sections: Analysis of singly and doubly reinforced flanged sections – Design of flanged sections- effective width of flange- Minimum depth and minimum tension reinforcement.

Shear and Torsion: Limit state design of section for Shear and torsion – Concept of Anchorage and development length, Deflection- IS Code provisions.

Unit-III: DESIGN OF SLABS **13 HOURS**

Slabs: Introduction to types of slabs- One way slab- two-way slabs- Design examples for one way and two-way slabs – Continuous slab design – Reinforcement detailing.

Unit-IV: DESIGN OF COLUMNS **12 HOURS**

Columns: Different types of columns – Design of short and long columns – Columns subjected to axial load – Columns subjected to uni-axial and bi axial bending – IS code provisions– Reinforcement detailing.

Unit-V: DESIGN OF FOOTINGS **12 HOURS**

Footings: Different types of footings – Design of isolated footings – Square, rectangular shape footings – Design of footings subjected to axial load and uni axial moment – Reinforcement Detailing.

Note: All designs from Unit II should be in limit state design.

Following plates should be prepared by the students.

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

FINAL EXAMINATION (END SEMESTER) PATTERN:

The end examination paper should consist of Part A and Part B. PART A consists of two questions (each 24 marks) in Design and Drawing out of which ONE question is to be answered. PART B should consist of five questions of 12m each in design out of which THREE are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

TEXT BOOKS:

1. Limit State Design, A. K. Jain.
2. Limit State Design of Reinforced concrete, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, 2007, Laxmi Publications.

REFERENCE BOOKS:

1. Reinforced concrete design, S.Unnikrishna Pillai & Devdas Menon, 3rd edition,Tata Mc.Graw Hill, New Delhi.
2. N.C. Sinha and S.K Roy, *"Fundamentals of Reinforced Concrete"*, 4th Edition, S. Chand publishers, 2002
3. N. Krishna Raju and R.N. Pranesh, *"Reinforced Concrete Design"*, 8th Edition, New age International Publishers, New Delhi, 2004.
4. Fundamentals of Reinforced concrete design, M.L. Gambhir, 3rd edition, Printice Hall of India Private Ltd.
5. IS Codes: IS 456:2000, IS 875(Part I & II)

III-Year-I Semester		L	T	P	C
		3	0	0	3
BUILDING SERVICES (OE3101A)					

Course Objectives:

At the end course the student able to know the requirements of building services such as

1. Types of air conditioning,
2. Types of transportation system,
3. Firefighting, electrical services,
4. Concepts of green building and energy efficient systems

Course Outcomes:

The Student will be able to

1. Gain a comprehensive understanding of various building services including different types of air conditioning systems, transportation systems, firefighting installations, and electrical services.
2. analyze factors such as building size, occupancy, and purpose to recommend suitable air conditioning, transportation, firefighting, and electrical solutions.
3. understand the importance of sustainable practices in building services and be able to identify strategies to reduce energy consumption, minimize environmental impact, and enhance overall building performance.
4. familiar with the relevant codes, standards, and regulations governing building service installations.

Unit-I **12 HOURS**

Introduction to Building Services:

Definitions - Objective and uses of services - Applications of services for different types building considering - Classification of services- Types of services and selection of services- Natural and artificial lighting principles and factors- Arrangement of luminaries, Distribution of illumination, Utilization factors- Necessity of Ventilation Types – Natural and Mechanical Factors to be considered in the design of Ventilation.

Unit II **12 HOURS**

Electrical Services and Layout:

Electrical services in the building -Technical terms and symbols for electrical installations and Accessories of wiring- Systems of wiring like wooden casing, cleat wiring, CTS wiring conduit wiring - Types of insulation- electrical layout for residence, small work shop, show room, school building, etc.

Unit III **12 HOURS**

Mechanical Services in Buildings:

Introduction of mechanical services - Lift - Definition, Types of Lifts, Design Considerations, Location, Sizes, Component parts - Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car. Elevators & Escalators -Different types of elevators and Escalators - Freight Elevators-Passenger elevators –Hospital elevators -Uses of different types of elevators and Escalators. 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, Split Unit).

Unit IV **12 HOURS**

Fire Protection, Acoustic and Sound Insulations:

Introduction- Causes of fire and Effects of fire General Requirements of Fire Resisting building as per IS and NBC 2005-Characteristics of Fire resisting materials- Maximum Travel Distance- ire Fighting

Installations for Horizontal Exit, Roof Exit / Fire Lifts, External Stairs- Requirement of good Acoustic -Various sound absolvent- Factors to be followed for noise control in residential building

Unit V **12 HOURS**

Miscellaneous Services and Green Buildings Provisions:

Rain water Harvesting for buildingsConcept of GREEN buildings -Components of GREEN building - Introduction and Significance to Grey water- Components of Grey water system -Management of Grey water system.

TEXT BOOKS:

1. A text book on Building Services by R. Udaykumar, Eswar Press, Chennai
2. Building Services by S. M. Patil, Seema Publication, Mumbai Revised edition
3. Heating, Ventilating and Air Conditioning: Analysis and Design, 6th Edition", Faye C. McQuiston, Jerald D. Parker and Jeffrey D. Spitler, John Wiley & Sons

REFERENCE BOOKS:

1. SP 7: 2005 National Building Code of India, Bureau of Indian Standards, BIS, New Delhi

2. Building Construction by B. C. Punmia, Laxmi Publications (P) Ltd., New Delhi

3. IS 3534: 1976 "Outline dimensions of electric lifts"

4. IS1860: 1980 "Code of Practice for Installation, Operation and Maintenance of Electric Passenger and Goods Lifts"

III-Year-I Semester		L	T	P	C
		3	0	0	3
DISASTER MANAGEMENT (OE3101B)					

Course Objectives:

The subject provides different disasters, tools and methods for disaster management

Course Outcomes:

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

- Understanding Disasters, man-made Hazards and Vulnerabilities
- Understanding disaster management mechanism
- Understanding capacity building concepts
- Understanding coping Strategies
- Understanding planning of disaster managements

UNIT - I **10 HOURS**

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional) Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

UNIT - II **10 HOURS**

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

UNIT - III **10 HOURS**

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

UNIT - IV **10 HOURS**

Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management.

UNIT - V **10 HOURS**

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans.

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.

2. Disaster Management by Mrinalini Pandey Wiley 2014.

3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

REFERENCES:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.

2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

III-Year-I Semester		L	T	P	C
		2	1	0	3
ADVANCED STRENGTH OF MATERIALS (20CE5P01)					

Course Objectives:

1. To give preliminary concepts of principal stresses developed in the cross section of the beams analytically as well as graphically due to stresses acting on the cross section and stresses on any inclined plane and to know different failure theories adopted in designing of structural members
2. To classify columns and calculation of load carrying capacity using different empirical formulas and to assess stresses due to axial loads for different end conditions.
3. To calculate combined effect of direct and bending stresses with different engineering structures.
4. To impart the concept of unsymmetrical bending, location of neutral axis and shear centre.
5. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section due to internal pressure.

Course Outcomes	
The student will be able to	
CO1	**Analyse:** principal stresses and understands theories of failure and its application. (Understanding, Analysing)
CO2	**Analyze and evaluate:** the stresses in columns by various theories. (Analyzing, Evaluating)
CO3	**Analyze:** strength and stability of structural members subjected to, direct and bending Stresses. (Applying, Analysing)
CO4	**Understand:** the concepts of unsymmetrical bending and shear center. (Understanding)
CO5	**Interpret:** the stresses in thick and thin cylindrical shells subjected to internal pressure (Understanding)

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 – Creating

UNIT-I: PRINCIPAL STRESSES

Introduction –Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses–Two perpendicular normal stresses accompanied by a state of simple shear — Principal stresses, Mohr's circle of stresses - graphical solutions (Basic concept)

Theories of Failures: Introduction – Various Theories of failures like Maximum Principal Stress theory – Maximum Principal Strain theory – Maximum shear stress theory – Maximum strain energy

theory – Maximum shear strain energy theory- Simple applications.

(14 Lectures)

UNIT-II: COLUMNS AND STRUTS

Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula. **(13 Lectures)**

UNIT-III: DIRECT AND BENDING STRESSES

Stresses under the combined action of direct loading and B.M., Core of a sections, stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to

direct loading and B.M. about both axes. **(14 Lectures)**

UNIT-IV: UNSYMMETRICAL BENDING

Introduction – Centroidal principal axes of section –Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis.

Shear Centre: Introduction - Shear centre for symmetrical and unsymmetrical sections- Basic concepts **(12 Lectures)**

UNIT-V: THIN CYLINDERS AND THICK CYLINDERS

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

Thick Cylinders: Introduction, Lame's theory for thick cylinders –Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders. **(12 Lectures)**

Text Books:

1. Mechanics of Materials- by R. C. Hibbler
2. Strength of materials by S. S. Bhavakatti
3. Strength of materials by R.K.Bansal vol. 1 & 2

Reference Books:

1. Fundamentals of Solid Mechanics M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.
2. Introduction to text book of Strength of Material by U.C. Jindal, Galgotia publications.
3. Strength of materials by R. Subramanian, Oxford university press, New Delhi.
4. Strength of Materials by S. Ramamrutham Dhanpat Rai Publishing Co., (P) Ltd. New Delhi
5. Theory of Structures by S.P.Timoshenko & DH. Young

III-Year-I Semester		L	T	P	C
		2	1	0	3

REINFORCED SOIL STRUCTURES (20CE5P01A)

Course Objectives:

1. To understand the history and mechanism of reinforced soil
2. To know the various types of geo-synthetics, their functions and applications.
3. To enable the design of reinforced soil retaining structures.

Course Outcomes:

The students will be able to

CO1: **Explain** – the principles and mechanisms of reinforced soil (Understanding)

CO2: ***Evaluate*** the applications of reinforced soil (Understanding, Evaluating)

CO3: ***Explain*** the functions of geotextiles (Understanding)

CO4: ***Analyse*** the durability of reinforcing materials (Analysing)

CO5: ***Applying*** -Develop the applications of reinforced soil in civil engineering (Applying)

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT-I **10 HOURS**

PRINCIPLES, MECHANISMS AND MATERIALS:

Historical background, principles, concepts and mechanisms of reinforced earth. Materials used in reinforced soil structures, fill materials, reinforcing materials- metal strips, Geotextile, Geogrids, Geomembranes, Geocomposites and Geojute, Geofoam, Natural fibers, facing elements, properties and methods of Testing.

UNIT– II **10 HOURS**

DESIGN ASPECTS AND APPLICATION:

Design aspects of reinforced earth, Design and applications of reinforced earth of various structures, like retaining walls, foundations, pavements, embankments and slopes

UNIT-III **12 HOURS**

DURABILITY OF REINFORCEMENT MATERIALS:

Measurement of corrosion factors, resistivity, redox potential, water content, pH, electrochemical corrosion, bacterial corrosion – influence of environmental factors on the performance of Geosynthetic materials. Testing of geotextiles.

UNIT-IV **12 HOURS**

CASE HISTORIES AND APPLICATIONS:

Performance studies of reinforced dams, embankments, pavements, foundations and underground structure - case studies.

UNIT-V **12 HOURS**

SOIL NAILING:

Concept of soil nailing, methods of nailing, advantages of nailing, limitations of the system, comparison of soil nailing with reinforced soil, applications.

TEXT BOOKS:

1. Gray, D.H., and Sotir, R.B., Biotechnical and Soil Engineering Slope Stabilization: A Practical Guide for Erosion control, 3rd Edition, John Wiley & Sons, 1996.
2. Koerner, R. M., "Design with Geosynthetics", 3rd Edition Prentice Hall, 2002
3. RamanathaAyyar ,T.S., Ramachandran Nair, C.G. and Balakrishna Nair, N., Comprehensive reference book on Coir Geotextile, 1st Edition, Centre for Development for Coir Technology,2002.
4. SivakumarBabu, G.L., An Introduction to Soil Reinforcement and Geosynthetics, 1st Edition, University Press (India), Pvt. Ltd., 2006.
5. Swami Saran, Reinforced Soil and its Engineering Applications", 1st Edition, IK International Pvt. Ltd., 2006

REFERENCES:

1. Christopher, B. R., et al., Reinforced soil structures, Vol. 1: Design and Construction guidelines, Report FHWA-RD-89-043, Federal Highway Administration, USA, 1990.
2. Gerard P.T.M. Van Santvrot, Geo-textiles and Geomembranes in Civil Engineering, 1st Edition, A. A. Balkema,Oxford and IBH Publishing Company, 2006.
3. John, N.W.M., Geotextiles. 2nd Edition, Blackie, 2004.
4. Mandal, J. N., Reinforced Soil and Geo-textiles, Proc. of IGC-1988, Oxford and IBH Publishing Company PrivateLtd., 1988.
5. Mandal, J. N., Geosynthetics World, 1st Edition, Wiley Eastern Limited, 2002.
6. Muller, W.W., HDPE Geomembranes in Geotechnics, 3rd Edition, Springer, 2007.
7. Tarmat, R. J., Geosynthetics: Applications, Design and Construction, Proc. of 1st European Geosynthetics Conference, Netherlands, A. A. Balkema, 2004.

CODES:

1. Federal Highway Administration, Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, Vols. I & 2, Publication No. FHWA-NHI-10-024, 2009.
2. BS 8006-1:2010, Code of practice for strengthened/reinforced soils and other fills, 2010.
3. BS 8006-2:2011, Code of practice for strengthened/reinforced soils. Soil nail design, 2011.

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III-Year-I Semester		L	T	P	C
		2	1	0	3
AIR POLLUTION AND CONTROL (20CE5P01B)					

Course Learning Objectives:

The course will address the following:

- To know the sources of air pollutants
- To know the analysis of air pollutants
- To know the Threshold Limit Values (TLV) of various air pollutants
- To learn plume behaviour in different environmental conditions
- To acquire the design principles of particulate and gaseous control
- To learn plume behaviour in different environmental conditions

Course Outcomes:

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

CO1	Decide the ambient air quality based on the analysis of air pollutants
CO2	Ascertain and evaluate sampling techniques for atmospheric and stack monitoring
CO3	Judge the plume behaviour in a prevailing environmental conditions and estimation of plume rise
CO4	Choose and design control techniques for particulate and gaseous Emissions
CO5	Selection of appropriate control measures for Automobile pollution

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

Unit –I Introduction **10 HOURS**

Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Environmental criteria for setting industries and green belts.

Unit –II Meteorology **10 HOURS**

Types of inversion, photochemical smog Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths.

Unit- III Ambient Air Quality Management **10 HOURS**

Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3)

Development of air quality models-Gaussian dispersion model

Unit IV Control Techniques **10 HOURS**

Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP**:** Control of NOx and SOx emissions – Environmental friendly fuels – In-plant Control Measures, process changes, methods of removal and recycling.

Unit V Air pollution due to automobiles **10 HOURS**

Air pollution due to automobiles, standards and control methods. Noise pollution causes, effects and control, noise standards.

Text Books:

1. Air Pollution and Control, K.V.S.G. Murali Krishna, Laxmi Publications, New Delhi, 2015

2. Air Pollution, M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company

3. Air pollution" H. C. Perkins, Tata McGraw Hill Publication

4. Introduction t o Environmental Engineering" Mackenzie Davis and David Cornwell, "McGraw-Hill Co.

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III-Year-I Semester		L	T	P	C
		2	1	0	3
AIRPORT PLANNING AND DESIGN (20CE5P01C)					

Course Objectives:

1. The module introduces the Airport planning issues along with the designing of Runway.

2. The visual aids required from Airport Traffic operating are dealt with the necessary inputs required for efficient drainage system has significance in maintenance the airport.

Course Outcomes:

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

1. Understand the regional planning concepts for an airport.

2. Design the runway length after considering the correction required for basic runway length.

3. Understand the Structural Design of Airport Pavements.

4. Understand the visual aids required for safe landing and takeoff operation of airport.

5. Analyze and design the Airport drainage.

UNIT - I **10 HOURS**

Airport Planning: General- Regional Planning- Development of New Airport- Data Required before Site Selection- Airport Site Selection- Surveys for Site Selection- Drawings to be prepared- Estimation of Future Air Traffic Needs.

UNIT - II **13 HOURS**

Runway Design: Runway Orientation- Basic Runway Length- Corrections for Elevation, Temperature and Gradient- Airport Classification- Runway Geometric Design- Airport Capacity- Runway Configurations- Runway Intersection Design.

UNIT - III **13 HOURS**

Structural Design Of Airport Pavements: Introduction- Various Design Factors- Design Methods for Flexible Pavement- Design Methods for Rigid Pavement- LCN System of Pavement Design- Joints in Cement Concrete Pavement- Airport Pavement Overlays- Design of an Overlay.

UNIT- IV **10 HOURS**

Visual Aids: General- Airport Marking- Airport Lighting.

UNIT - V **10 HOURS**

Airport Grading And Drainage: General- Computation of Earthwork- Airport Drainage- Special Characteristics and Requirements of Airport Drainage- Design Data- Surface Drainage Design Subsurface Drainage Design.

REFERENCE BOOKS:

1. Airport Planning And Designing by S.K. Khanna, M.G. Arora.

2. Highway Engineering including Expressways and Airport Engineering by Dr. L.R. Kadyali, Dr.N.B. Lal.

3. Highway Engineering including Airport Pavements by Dr. S.K. Sharma.

4. Transportation Engineering by S.P. Chandola.

III-Year-I Semester		L	T	P	C
		3	0	0	3

WATERSHED MANAGEMENT (20CE5P01D)

Course Objectives:

1. Introduce the concept of watershed management
2. Understand the watershed characteristics
3. Learn the principles of soil erosion and measures to control erosion
4. Appreciate various water harvesting techniques.
5. Learn land management practices for various land use/land cover.

Course Outcomes:

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

CO1: Describe the concepts of watershed development

CO2: Explain the reasons for the erosion from the watershed and the methods to control it

CO3: Explain the methods of water harvesting

CO4: Discuss about land use management

CO5: Describe the role of ecosystem in bringing the best water use practices and apply the knowledge to plan watershed development activities

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

Unit-I: **10 HOURS**

INTRODUCTION: Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

Unit– II: **10 HOURS**

CHARACTERISTICS OF WATERSHEDS: Physiography - Size, shape, slope, drainage; climate, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

Unit-III: **12 HOURS**

PRINCIPLES OF EROSION: Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation.

MEASURES TO CONTROL EROSION: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

Unit-IV: **12 HOURS**

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: **10 HOURS**

LAND MANAGEMENT: Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

TEXT BOOKS:

1. 'Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.
2. 'Land and Water Management' by Murthy.VVN, Kalyani Publications, 2007.
3. 'Watershed Management' by Murthy J V S, New Age International Publishers, 2006.

REFERENCES:

1. 'Water Resource Engineering' by Wurbs R A and James R A, Prentice Hall Publishers, 2002.
2. 'Watershed Hydrology' by Black P E, Prentice Hall, 1996.

III-Year-I Semester		L	T	P	C
		0	0	3	1.5

ENVIRONMENTAL ENGINEERING LABORATORY (20CE5L01)

Course Objectives:

This course deals with the laboratory approaches of determining certain major parameters related to water and wastewater quality and analyzing the laboratory data with respect to permissible limits and field conditions.

Course Outcomes:

At the end of the course the students can able to

CO1: Assess physical parameters of water as turbidity and colour
CO2: Determine the chemical characteristics as pH, TDS
CO3: Assess pollution characteristics of waste water by analyzing DO, BOD and COD
CO4: Assess the total hardness of a given water sample
CO5: Calculate the amount of coagulant required for optimum sedimentation for a given turbid sample

LIST OF EXPERIMENTS

The following tests are to be performed on a water/wastewater sample.

1. Determination of pH value and Conductivity.
2. Determination of Turbidity of water sample.
3. Determination of TDS in water sample.
4. Determination of Total, temporary and permanent hardness of water sample.
5. Determination of Total, Calcium and Magnesium hardness of water sample.
6. Determination of Chloride concentration of water sample.
7. Determination of Acidity of water sample.
8. Determination of Alkalinity of water sample.
9. Determination of Fluorides in water sample.
10. Determination of Iron.
11. Determination of Sulphates in water sample.
12. Determination of Residual chlorine in water sample.
13. Determination of Dissolved Oxygen of water sample.
14. Determination of Optimum dose of coagulant.
15. Determination of Settleable solids using Imhoff cone in sewage sample.
16. Determination of Suspended, fixed and volatile solids in sewage sample.
17. Determination of Total, fixed and volatile solids in sewage sample.
18. Determination of Biochemical Oxygen Demand (BOD) of sewage.
19. Determination of Chemical Oxygen Demand (COD) of sewage.

Note: A minimum of twelve (12No) shall be done and recorded

TEXT BOOK/REFERENCE

Laboratory manual prepared by Civil Engineering Department

REFERENCES:

1. National Environmental Engineering Research Institute, "Laboratory manual on water analysis", NEERI, Nagpur, India, 1987.
2. Sawyer and Mc Carty, "Chemistry for Environmental Engineering" McGraw-Hill, 1978.
3. Relevant IS Codes.
4. Chemistry for Environmental Engineering by Sawyer and McCarty.

III-Year-I Semester		L	T	P	C
		0	0	3	1.5

TRANSPORTATION ENGINEERING LABORATORY (20CE5L02)

Course Learning Objectives:

The objectives of this course are:

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

Course outcomes:

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

a. Test aggregates and judge the suitability of materials for the road construction

b. Test the given bitumen samples and judge their suitability for the road construction

c. Obtain the optimum bitumen content for Bituminous Concrete

d. Determine the traffic volume, speed and parking characteristics.

e. Draw highway cross sections and intersections.

SYLLABUS

I. ROAD AGGREGATES:

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

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.

4. Flash and fire point tests.

5. Stripping Test

6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.

2. Traffic Volume Studies (Turning Movements) at intersection.

3. Spot speed studies.

4. Parking study.

LIST OF EQUIPMENT:

1. Apparatus for aggregate crushing test.

2. Aggregate Impact testing machine

3. Pycnometers

4. Los angles Abrasion test machine

5. Deval's Attrition test machine

6. Elongation and thickness gauges

7. Bitumen penetration test setup.

8. Bitumen Ductility test setup.

9. Ring and ball apparatus

10. Viscometer.

11. Marshal Mix design apparatus.

12. Enoscope for spot speed measurement.

13. Stop Watches

TEXT BOOKS:

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

2. Highway Material Testing & Quality Control by Rao Wiley India pvt. Ltd., Noida, New Delhi

REFERENCE BOOKS:

1. IRC Codes of Practice

2. Asphalt Institute of America Manuals

3. Code of Practice of B.I.S.

III-Year-I Semester		L	T	P	C
		0	0	3	1.5

ENGINEERING GEOLOGY LABORATORY (20CE5L03)

Course objectives:

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

Course Outcomes:

At the end of the course the students can able to

CO1: Identify and classify the geological minerals

CO2: Measure the rock strengths of various rocks

CO3: Prepares, analyses and interpret the Engineering Geologic maps.

CO4: Test the geological material and ground to check the suitability of civil engineering project construction.

CO5: Investigate the project site for mega/mini civil engineering projects site selection for mega engineering projects like Dams, Tunnels, disposal sites etc

LIST OF EXPERIMENTS

1. Description of Physical properties of minerals. (Demonstration)
2. 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…
3. Description of Various Classification of Rocks and their properties. (Demonstration)
4. Identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, GranitePoryphery, 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…
5. Study of common Goelogical Structures and Importance in Civil Engineering. (Demo)
6. Interpretation and drawing of sections for geological maps showing tilted beds, faults,unconformities etc.
7. Simple Structural Geology problems.
8. Strength of the rock using laboratory tests.
9. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.
10. A Report on importance of Study of Geology in Constrction & Selection of site for mega/mini civil engineering projects like Dams, Tunnels, disposal sites etc.

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III-Year-I Semester		L	T	P	C
		1	0	2	2
SKILL ADVANCED COURSE 1 - SOFT SKILLS (20CE5E01)					

Prerequisite : Learnability Quotient (LQ)

Course Objectives:

- ✓ Communicate clearly, confidently, concisely, and persuasively both written as well as orally.
- ✓ rediscover and boost self-confidence, to the zenith, and solve issues with ease
- ✓ recognize the results (change) of their behavior / conduct and teach them to take ownership of their acts
- ✓ build confidence in their speaking / presentation skills and become industry-ready
- ✓ develop a stronger sense of consciousness and appreciation for others by analyzing prospects, and creating choices
- ✓ foster strong self-competence and self-confidence

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

CO 1	master advanced nuances of both written and oral communication skills that are imperative for any professional to succeed
CO 2	confidently ace different competitive exams and develop writing skills
CO 3	able to enhance oral communication overcoming stage fright
CO 4	gain awareness of the industry expectations and draft CV / Résumé in lieu with desired job profiles
CO 5	crack behavioral (HR) interview confidently and exhibit professional persona

Module 1 Effective communication skills

- ✓ Start with self and connect with others.
- ✓ The art of narrating and storytelling.
- ✓ Enhance teamwork and influence change.

Module 2 Advanced verbal ability concepts – practice and professional writing skills

- ✓ Nurture and enhance the verbal ability strength through practice.
- ✓ Conducting mock verbal (ability) tests and their timely review.
- ✓ List the steps of writing an email effectively & comprehend the importance of structuring an email.
- ✓ Overview of various elements related to accuracy, brevity and correctness in our everyday writing at the workplace (Project proposals / covering letters / blogs / short essays)

Module 3 Industry sneak and résumé / CV building strategies

- ✓ Industry & aspirant career expectations and tailoring action learning plan aptly.
- ✓ Crafting winning résumé(s) suiting to different profiles.
- ✓ Framing responses to résumé-based interview questions.

Module 4 Behavioral competency building – Part II and Psychometric test (HR Round Preparation)

- ✓ Listing personal characteristics and preparing blueprint to inculcate them.
- ✓ Assess the students' ability to fit into a specific work environment or with specific personality types.
- ✓ Determine basic characteristics of an individual.

Module 5 Presentation skills & Mock interviews

- ✓ Illustration of presentation structure via impromptu / free speech – and essential criteria for an effective presentation
- ✓ Importance of non-verbal communication (signposting)
- ✓ Presenting competencies and experience
- ✓ Inciting the interview process by practicing a gamut of behavioral mock interviews.

Module 1 –Tasks

- ✓ Listening & comprehension skills – lessons from the corporate training videos / scenes in films.
- ✓ Role play – story telling & anchoring
- ✓ Extempore – students' experience with college/program.
- ✓ Listening & comprehension skills – lessons from the corporate training videos / scenes in films

Module 2 -Tasks

- ✓ Story paraphrasing, peer introduction and monologue.
- ✓ Book / movie review
- ✓ Assignment on short essay and blog building/digital profile creation.

Module 3 -Tasks

- ✓ Overview & analysis of a Job Description(JD) and its reflection in resume / self introduction
- ✓ Crafting of resumes by mapping skills & competences to different profiles offered for engineering graduates.
- ✓ An act on – one day in the life of an HR manager/ Project leader etc.

Module 4 -Tasks

- ✓ Case scenarios – to identify behavioral competencies and personality traits through actionable feedback.
- ✓ Increase self-awareness and improve interactions with others.
- ✓ Self reflection on industrial expectation of skill cluster.

Module 5 -Tasks

- ✓ Exhibiting leadership qualities while participating in group discussions.
- ✓ Pair & Group work – debating / demonstration of product promotion, etc.
- ✓ Peer evaluations (mock interviews by peers and facilitator) that utilize multisource feedback to allow students to obtain different perspectives of their current skill proficiency.

Reference Books

1. Ramesh, Gopalaswamy. *The Ace of Soft Skills*: *Attitude, Communication and Etiquette for Success,* Pearson Education; 2013.
2. Mitr, Barun K. *Personality Development & Soft Skills*, Oxford Publishers, 2017.
3. ICT Academy of Kerala. *Life Skills for Engineers*, McGraw Hill Education (India) Private Ltd., 2016.
4. Caruso, D. R. and Salovey P. *The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership*, John Wiley & Sons, 2004.
5. Dr. Chakravarthi, Lata & Kalyana. *Soft Skill for Managers*; Wiley Publishing Ltd, 2015.
6. James, Larry. *The First Book of Life Skills*. Embassy Books, 2016.
7. Verma, Shalini, *Development of Life Skills and Professional Practice*; Sultan Chand & Company, 2014.
8. Goleman, Daniel. *Emotional Intelligence*. Bantam, 2006.
9. Remesh S.& Vishnu R.G. *Life Skills for Engineers*, Ridhima Publications, 2016.
10. Butterfield, Jeff. *Soft Skills for Everyone*. Cengage Learning India Pvt. Ltd, 2011.

Digital References

1. Infosys Springboard (https://infyspringboard.uk.onwingspan.com/web/en/login)
2. AICTE Digital Learning Portal (https://free.aicte-india.org/)
3. NASSCOM Future Skills prime (https://learn.futureskillsprime.in/log_in)
4. APSCHE LMS – Bringing Learning to People (https://apschelms.e-pragati.in/#/)
5. Dale Carnegie Academy (https://www.dalecarnegie.com/en)
6. TedX Program (https://www.ted.com/about/programs-initiatives/tedx-program)
7. Toast Masters International (https://www.toastmasters.org/)
8. NPTEL (https://nptel.ac.in/)
9. Sololearn/ Coursera / Udemy / Unacademy / Wikipedia (https://en.wikipedia.org/wiki/Main_Page)

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III-Year-I Semester		L	T	P	C
		2	0	0	0

ENVIRONMENTAL SCIENCE (20SH5N01)

OBJECTIVE:
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.

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

CO1	Able to U**nderstand** The concepts of the ecosystem
CO2	Able to U**nderstand** The natural resources and their importance
CO3	Able to learn The biodiversity of India and the threats to biodiversity ,and **Apply** conservation practices
CO4	Able to learn Various attributes of the pollution and their impacts
CO5	Able to U**nderstand** Social issues both rural and urban environment
CO6	Able to U**nderstand** About environmental Impact assessment and **Evaluate** the stages involved in EIA

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:

LEARNING OUTCOMES
Students will be able to
1. articulate the basic structure, functions, and processes of key social systems affecting the environment.
2. explain how water resources should be used.
3. articulate basic understanding of effects of modern agriculture on environment.
4. explain how various paradigms or world views and their implicit and explicit assumptions and values shape the viewer's perception of environmental problems and solutions.

UNIT – II: Ecosystems, Biodiversity, and its Conservation
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 : 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.

LEARNING OUTCOMES

Students will be able to

1. get a clear picture of structure and functions of ecosystems.
2. explain why renewable and non-renewable energy resources are important.
3. get awareness about land degradation, soil erosion & desertification.
4. gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.

UNIT – III: Environmental Pollution and Solid Waste Management

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.

LEARNING OUTCOMES UNIT-3

Students will be able to

1. demonstrate knowledge and understanding of theories in the field of Biodiversity and Systematics in the broad sense.
2. conduct basic conservation biology research.
3. explain endangered and endemic species of India.
4. identify the threats to biodiversity.

UNIT – IV: Social Issues and the Environment

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.

LEARNING OUTCOMES:

Students will be able to

1. understand Cause, effects and control measures of air pollution.

2. understand soil, noise & water pollution.
3. explain the enforcement of Environmental legislation
4. understand solid waste management.

UNIT – V: Human Population and the Environment

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – 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..

LEARNING OUTCOMES

Students will have

1. knowledge about watershed management and environmental ethics.
2. explain the reasons for global warming
3. explain principles and impact of disasters on environment.
4. explain disaster management cycle in India.

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

REFERENCES :

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

III-Year-I Semester		L	T	P	C
		0	0	3	1.5
SUMMER INTERNSHIP (20CE5R01)					

III-Year-II Semester		L	T	P	C
		3	0	0	3

UNIVERSAL HUMAN VALUES (20SH6T01)

Course Educational Objective: To become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

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

CO1: Apply the value inputs in life and profession **(Apply – L3)**

CO2: Distinguish between values and skills, happiness and accumulation of physical facilities, the self, and the Body **(Understand – L2)**

CO3: Understand the role of a human being in ensuring harmony in society **(Understand – L2)**

CO4: Understand the role of a human being in ensuring harmony in the nature and existence. **(Understand – L2)**

CO5: Distinguish between ethical and unethical practices (**Apply – L3**)

UNIT-I: Need, Basic Guidelines, Content and Process for Value Education

'Natural Acceptance' and Experiential Validation- as the process for self-exploration; Continuous Happiness and Prosperity- A look at basic Human Aspirations; Right understanding, Relationship and Physical Facility, Understanding Happiness and Prosperity

UNIT-II: Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'; Understanding the needs of Self ('I') and 'Body' - happiness and physical facility;
Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer);
Understanding the characteristics and activities of 'I' and harmony in 'I'; Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

UNIT-III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship;

Understanding the harmony in the society: Resolution, Prosperity, fearlessness and co-existence as comprehensive Human Goals; Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family, Gratitude as a

universal value in relationships.

UNIT-IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence, Understanding the harmony in the Nature; Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature; Understanding Existence as Coexistence of mutually interacting units in all-pervasive space; Holistic perception of harmony at all levels of existence.

UNIT-V: Implications of the above Holistic Understanding of Harmony on Professional Ethics
Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics, Strategy for transition from the present state to Universal Human Order

Text Book:

Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

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III-Year-II Semester		L	T	P	C
		2	1	0	3

DESIGN AND DRAWING OF STEEL STRUCTURES (20CE6T01)

Prerequisites:

1. Structural Analysis

Course Objectives:

The objective of this course is to:

- Familiarize Students with different types of Connections and relevant IS codes
- Equip student with concepts of design of flexural members
- Understand Design of tension and compression members
- Familiarize students with types of Columns, column bases and their Design
- Familiarize students with Design of Gantry Girder and Roof Trusses

Course Outcomes:

At the end of successful completion of this course, the student will be able to

CO1: Analyze and design welded and bolted connections

CO2: Design Tension members, Simple and Built-up compression members

CO3: Design Laterally-Supported and Laterally-Unsupported Beams

CO4: Design Beam-Columns, Column Splices and Bases

CO5: Analyze, Design and Detail Gantry girder and Roof Trusses

UNIT – I **14 HOURS**

Introduction: Types of steel structures and components; Hot rolled structural steel; Grades of structural steel and Mechanical properties of steel; Loads and Load combinations; Concepts of limit State Design – Limit State of Collapse and Limit State of Serviceability; Plate / local buckling, Concept of Plasticity; Advantages and disadvantages of steel structures

Bolted Connections: Behaviour of bolted connections; Advantages and Disadvantages of Bolted connections, failures & Limit States of Strength; Design provisions for bolts as per IS 800:2007; Design of simple bolted connections; Design of Eccentric (Bracket) Connections: Moment in-plane and perpendicular to plane of joint

UNIT – II **14 HOURS**

Welded Connections: Welding Methods, Types of Welds, Weld positions, Advantages and Disadvantages of welding, Design of simple welded connections; Design of Eccentric (Bracket) Connections: Moment in-plane and perpendicular to plane of joint

Tension Members: Net area; shear-lag; failure modes and limit states of strength - yielding, rupture and block Shear; Design provisions as per IS 800:2007; Design of Tension Members.

UNIT –III **14 HOURS**

Compression Members: Behaviour of short, long and Intermediate members under axial compression - Effective length and Slenderness ratio; Types of Buckling; Limit states of strength and Design provisions as per IS 800:2007; Design of Struts and Simple Columns; Design of Laced and Battened built-up compression members.

Roof Trusses: Types of trusses; pitch of truss; Calculation of Dead, Live and Wind Loads on roof truss; Design of Tubular Truss members and joints

UNIT – IV **14 HOURS**

Beams: Behaviour of Laterally Supported Beams – Collapse mechanism, yielding, plastic hinge and plastic section modulus; Laterally Un-Supported Beams : Lateral – Torsional Buckling and Elastic Critical Moment; Classification of beams and failure modes; Shear behaviour; Design provisions as per IS 800: 2007; Web-Crippling; Web Buckling; Deflection limits; Design of Laterally Supported and Un-Supported Beams; Design of purlins.

UNIT – V **14 HOURS**

Beam-Columns: Eccentric loading and behaviour of beam-columns; P-delta effects; Equivalent moment factor; Failure modes; Limit states of strength and Design provisions as per IS 800:2007; Design of beam-column subjected to axial compression and bi-axial bending

Column Splices & Bases: Design of Column Splices; Design of slab base and gusseted base

NOTE: Welded connections should be used in Units III – V.

The students should prepare the following plates.

Plate 1 Detailing of Welded Lap Joint

Plate 2 Detailing of Beams

Plate 3 Detailing of Built-up Column including lacing and battens,

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

Plate 5 Detailing of steel roof trusses including joint details

FINAL EXAMINATION (END SEMESTER) PATTERN:

The end examination paper should consist of Part A and Part B. PART A consists of two questions (each 24 marks) in Design and Drawing out of which ONE question is to be answered. PART B should consist of five questions of 12m each in design out of which THREE are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

TEXT BOOKS

1) K. S. Sai Ram, Design of Steel Structures, Pearson Education (India), 2020

2) N. Subramanian, Design of Steel Structures, Oxford University Press (India), 2015

REFERENCES / FURTHER READING

1) S. K. Duggal, Limit State Design of steel structures, Tata McGraw-Hill, New Delhi, 2019
2) M. L. Gambhir, Fundamentals of Structural Steel Design, Tata McGraw-Hill, 2013
3) D. Lam et al., Structural Steelwork: Design to Limit State Theory (BS 5950), CRC press, 2004

IS Codes:

1) IS 800:2007, Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi.
2) IS – 875 Parts I- III, Code of practice for design loads (other than earth quake) for buildings and Structures (Part-1-Part 5), Bureau of Indian standards.
3) Steel Tables

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

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III-Year-II Semester		L	T	P	C
		2	1	0	3
EARTH RETAINING STRUCTURES (20CE6P01)					

Course Objectives:

1. To enable the student to understand the concepts of earth pressures and different theories.
2. To impart the concept of retaining walls, types of failures, stability requirements.
3. To impart the concept of sheet pile wall, cantilever, anchored sheet piles, location and forces in anchors.
4. To enable the student to understand the concepts of soil reinforcement braced cuts and cofferdams.

Course Outcomes:

The students will be able to

CO1: ***Explain*** – the types of earth pressures and classical theories and computation of pressures in homogenous and layered soils (Understanding, analysing)

CO2:***Understanding***-the types and failure of retaining wall, stability requirements (Understanding, Evaluating)

CO3: ***Analyse*** –Cantilever and anchored sheet piles and evaluating location and forces in anchors (Analysing, Evaluating)

CO4: ***Understanding-*** the concept and mechanism of soil reinforcement and design of embankment (Understanding Applying)

CO5: ***Explain***- the concept of braced cuts and cofferdams (Understanding)

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT-I **10 HOURS**

EARTH PRESSURES

Different types and their coefficients- Classical Theories of Earth pressure – Rankine's and Coulomb's Theories for Active and Passive earth pressure- Computation of Lateral Earth Pressure in Homogeneous and Layered soils- Graphical solutions for Coulomb's Theory in active and passive conditions.

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UNIT– II **10 HOURS**

RETAINING WALLS

Different types - Type of Failures of Retaining Walls– Stability requirements – Drainage behind Retaining walls – Provision of Joints – Relief Shells.

UNIT-III **11 HOURS**

SHEET PILE STRUCTURES

Types of Sheet piles – Cantilever sheet piles in sands and clays – Anchored sheet piles – Free earth and fixed earth support methods – Row's moment reduction method – Location

of anchors, Forces in anchors.

UNIT-IV **12 HOURS**

SOIL REINFORCEMENT

Reinforced earth - Different components – their functions – Mechanics of reinforced earth – Failure modes-Failure theories – Design of Embakments on problematic soils.

UNIT-V **13 HOURS**

BRACED CUTS AND COFFERDAMS:

Lateral Pressure in Braced cuts – Design of Various Components of a Braced cut – Stability of Braced cuts – Bottom Heave in cuts. – types of cofferdam, suitability, merits and demerits – Design of single – wall cofferdams and their stability aspects– TVA method and Cummins' methods.

TEXT BOOKS:

1. Principles of Foundation Engineering by Braja M. Das.
2. Foundation analysis and design – Bowles, JE – McGraw Hill

REFERENCES:

1. Soil Mechanics in Engineering Practice – Terzaghi, K and Rolph, B. peck 2nd Edn. – John Wiley & Co.,
2. Analysis and Design of Foundations and Retaining Structures, Prakash, S – Saritha Prakashan, Mearut.

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III-Year-II Semester		L	T	P	C
		2	1	0	3
EARTHQUAKE RESISTANT DESIGN OF STRUCTURES (20CE6P01A)					

Course Objectives:

1. To give preliminary concepts of engineering seismology and structural dynamics.
2. To impart concepts of design philosophies for seismic building designs for given loading conditions.
3. Equip student with concepts of Structural Dynamics.
4. Familiarize students with various IS codal provisions for seismic design of buildings, shear walls design and detailing.

Course Outcomes:

The students will be able to

CO1: ***Understand*** the fundamentals of Engineering Seismology. (Understanding)

CO2: ***Analyse*** the applications with the principles of Structural Dynamics. (Understanding, Analysing)

CO3: ***Apply*** different design methods and analyse the various Seismic designs according to IS standard provisions (Applying, Analysing)

CO4: ***Design*** of buildings subjected to earthquake loads and shear walls. (Designing)

CO5: ***drawing*** the reinforcement detailing of computed seismic designs as per IS codal provisions. (Applying, Analysing)

UNIT-I: ENGINEERING SEISMOLOGY 8 HOURS

Introduction – rebound theory – plate tectonics – seismic waves - earthquake size and various scales – local site effects – Indian seismicity – seismic zones of India – theory of vibrations.

Unit– II: INTRODUCTION TO STRUCTURAL DYNAMICS 10 HOURS

Fundamental objective of Dynamic analysis – Types of prescribed loadings – Formulation of the Equations of Motion– Elements of a Vibratory system – Free Vibrations of Single Degree of Freedom (SDOF) systems – Un damped and damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor.

Unit-III: SEISMIC DESIGN CONCEPTS 12 HOURS

EQ load on simple building – load path – floor and roof diaphragms – seismic resistant building architecture – plan configuration – vertical configuration – pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic code (IS 1893 & 13920) –Shear wall and design of shear wall.

Unit-IV: CODAL DESIGN PROVISIONS 12 HOURS

Review of the latest Indian seismic code IS:1893 – 2002 (Part-I) provisions for buildings – Earthquake design philosophy –Assumptions – Analysis by seismic coefficient and response spectrum methods – Displacements and drift requirements – Provisions for torsion – Analysis of a

multi-storeyed building using Seismic Coefficient method.

CODAL DETAILING PROVISIONS: Review of the latest Indian codes IS: 4326 and IS: 13920 Provisions for ductile detailing of R.C buildings – Beam, column and joints

Unit-V: CALCULATION OF EQUIVALENT LATERAL FORCE 14 HOURS

Calculation of equivalent lateral force- Design Base Shear- Storey Shear, Estimation of Natural period of Structure, Computation of Response acceleration Coefficient- Zone factor- Seismic weight- Response reduction factors- Seismic Coefficient Method – response spectrum method

TEXT BOOKS:

1. 'Earthquake Resistant Design of Structures' -Pankaj Agarwal and Manish ShriKhande, Prentice – Hall of India, 2007, New Delhi..
2. S.K.Duggal, "Earth Quake Resistant Design of Structures", Oxford university Press, 1st Edition, 2012

REFERENCE BOOKS:

1. Clough & Penzien, "Dynamics of Structures", 4th Edition, McGraw Hill, International Edition, 2008.

2. Chopra A.K., "Dynamics of Structures", 5th Edition, Pearson Education, Indian Branch, Delhi, 2007

3. 'Earthquake Resistant Design of Building Structures' by Vinod Hosur, Wiley India Ltd.

4. IS Codes: IS: 1893, IS: 4326 and IS:13920, Bureau of Indian Standards, New Delhi.

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III-Year-II Semester		L	T	P	C
		3	0	0	3

INDUSTRIAL WASTE AND WASTE WATER ENGINEERING (20CE6P01B)

Course Objectives:

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

Course Outcomes:

The students will be able to:

CO1: **Assess** the characteristics of industrial effluents and their effects on the environmentincluding their tolerance limits

CO2: **Describe** the basic principles of industrial waste water treatment by physical methods.

CO3: **Discuss** the sources, characteristics and treatment of food industrial wastes.

CO4: **Identify** the sources, characteristics and treatment of major industrial waste of ThermalPower Plants, Oil Refineries, Steel mills and Cement industries.

CO5: **Identify** the sources, characteristics and treatment of Chemical industrial wastes.

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

Unit-I: INTRODUCTION **10 HOURS**

General Characteristics of Industrial effluents, Effects on Environment – ISI tolerance limits for discharging industrial effluents into surface water, into public sewers and on to land for irrigation.

Unit– II: TREATMENT OF INDUSTRIAL WASTE WATER **10 HOURS**

Necessity of treatment –Segregation – Process changes – Salvaging–Byproduct Recovery –Ion Exchange, Electro dialysis, Solvent Extraction, Floatation – Removal of Nitrogen and Phosphorus – Boiler water treatment methods and cooling water treatment methods.

Unit-III: FOOD INDUSTRIES **10 HOURS**

Sources, characteristics treatment and recycling of waste water from Sugar, Dairy and Distilleries, Food Processing industries, Aqua industry.

Unit-IV: MAJOR INDUSTRIAL EFFLUENTS **10 HOURS**

Sources, characteristics, treatment and recycling of waste water from Power plants, Oil refineries, Cement and Steel factories.

Unit-V: CHEMICAL INDUSTRIES **10 HOURS**

Sources, characteristics, treatment and recycling of waste water from Paper and pulp, Tanneries, Textiles, Fertilizers and Pharmaceutical industries.

TEXT BOOKS:

1. Rao, M.N. and Dutta, A.K., "Wastewater Treatment", 3rd Edition, IBH Publishers, 1982.
2. Patwardhan,"Industrial Wastewater Treatment"- PHI learning Pvt. Ltd, 2009.
3. Industrial Wastewater Treatment by KVSG Murali Krishna, Paramount Publishers, Visakhapatnam, 2019
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rdEdition

REFERENCE BOOKS:

1. Nemerow. N.L., "Liquid Waste from industry – Theories, Practice and Treatment"Addison wisely, 1996.
2. Benefield L.D. and Randall C.D, "Biological Process Designs for Wastewater AdvancedWaste Treatment Methods "Removal Suspended solids – Dissolved solid Treatment", Prentice Hall Pub. Co., 1980.
3. Metcalf and Eddy. "Wastewater Engineering – Collection, Treatment, Disposal and Reuse",McGraw Hill Pub. Co., 1995.
4. C. Fred Gurnham" Industrial WasteWater Control", (Revised for publication January 28,1977) 31 May, 2007.
5. Gurnham, C.F., "Principles of Industrial Waste Water: Wiley; New York, 1955.
6. Gurnham CF (Ed) "Industrial WasteWater Control"; Academic Press; New York, NY,1965.

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III-Year-II Semester		L	T	P	C
		3	0	0	3

ROAD SAFETY ENGINEERING (20CE6P01C)

Course Objectives:

1. This module on the fundamental of traffic engineering, Highway safety factors, Road safety improvement strategies are discussed
2. The Analysis of Crash Data and some of the statistics methods to analysis the traffic safety.
3. The accident interrogations & risk involved and role of road safety in planning the urban Infrastructures design is discussed.
4. The Basic physics related to crash reconstruction & Variables involved in crashes are studied
5. The various mitigation measures that to be taken for avoiding the accidents are discussed.

Course Outcomes:

The students will be able to

CO1: To remember and understand the fundamentals of Road Safety Engineering.

CO2: To investigate & analyze the collective factors for accident involved.

CO3: To understand & investigate road safety audit.

CO4: To understand and apply crash reconstruction process.

CO5: To apply mitigation measures by better designing of roads.

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT I **10 HOURS**

Introduction to safety

Road accidents, Trends, causes, Collision diagrams; Highway safety; Human factors and road user limitations; Speed and its effect on road safety; Vehicle factors; Highway safety in India. Multi-causal dynamic systems approach to safety; Crash Vs Accident; Road safety improvement strategies; Elements of a road safety plan, Safety data Needs; Safe vehicle design.

UNIT II **10 HOURS**

Statistical Interpretation and Analysis of Crash Data

Before-after methods in crash analysis, Recording of crash data; Accident Investigation and Analysis; Statistical testing and the role of chance; Black Spot Identification and Investigations, Case Studies.

UNIT III **10 HOURS**

Road Safety Audits

Key elements of a road safety audit, Road Safety Audits & Investigations, Work zone safety audit; Crash investigation and analysis, Methods for identifying hazardous road locations, Case Studies.

UNIT IV **10 HOURS**

Crash Reconstruction

Describe the basic information that can be obtained from the roadway surface, understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and flip crashes, variables involved in pedestrian crashes, Case Studies.

UNIT V **10 HOURS**

Mitigation Measures

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law.

TEXT BOOKS:

1. Institute of Transportation Engineers (ITE), The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999.
2. Towards Safe Roads in Developing country, TRL – ODA, 2004.
3. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
4. Fundamentals of Transportation Engineering – C.S. Papacostas, Prentice Hall India.

REFERENCES:

1. Athelstan Popkess, Traffic Control and Road Accident Prevention, Chapman and Hall, 1997 (Digitized 2008)
2. Ezra Hauer, Observational Before-After Studies in Road Safety, Pergamon Press, 1997 (reprinted 2002).
3. Geetam Tiwari and Dinesh Mohan, Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, CRC Press, 2016.
4. Transportation Engineering – An Introduction, C.Jotinkhisty, B. Kent Lall
5. Fundamentals of Traffic Engineering, Richardo G Sigua
6. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson
7. Road Safety by NCHRP.

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III-Year-II Semester		L	T	P	C
		2	1	0	3
GROUND WATER DEVELOPMENT & MANAGEMENT (20CE6P01D)					

Course Learning Objectives:
The course is designed to

- Appreciate groundwater as an important natural resource.
- Understand flow towards wells in confined and unconfined aquifers.
- Understand the principles involved in design and construction of wells.
- Create awareness on improving the groundwater potential using various recharge techniques.
- Know the importance of saline water intrusion in coastal aquifers and its control measures.

Course Outcomes:

The students will be able to

CO1: Estimate aquifer parameters, yield of wells and Analyse radial flow towards wells in confined and unconfined aquifers.
CO2: Design wells and understand the construction practices.
CO3: Determine the process of artificial recharge for increasing ground water potential.
CO4: Take effective measures for controlling saline water intrusion.
CO5: Apply appropriate measures for ground water management.

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT – I **12 HOURS**

Introduction:
Groundwater in the hydrologic cycle, ground water occurrence, aquifer parameters and their determination,general ground water flow equation.
Well Hydraulics: Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers,Theis solution, Jocob and Chow's methods, Leaky aquifers.

UNIT – II **12 HOURS**

Well Design:
Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screenselection, design of collector wells, infiltration gallery

UNIT –III **10 HOURS**

Well Construction and Development:
Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens- pull-back method, open- hole, bail- down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT IV: Artificial Recharge: **10 HOURS**

Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow,flooding and recharge well methods, recharge mounds and induced recharge

Saline Water Intrusion: Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface,control of saline water intrusion.

UNIT – V **10 HOURS**

Groundwater Modelling and Management:

Basic principles of groundwater modelling- Analog models-viscous fluid models and membrane models,digital models-Finite difference and finite element models.

Concepts of groundwater management, basin management by conjunctive use-case studies.

Text Books:

1. Groundwater, Raghunath H M, New Age International Publishers, 2005.
2. Groundwater Hydrology, Todd D. K., Wiley India Pvt Ltd.,2014.
3. Groundwater Hydrology, Todd D K and L W Mays, CBS Publications,2005.

References:

1. Groundwater Assessment and Management, Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. Groundwater Hydrology, Bouwer H, McGraw Hill Book Company, 1978.
3. Groundwater Systems Planning and Management, Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. Groundwater Resources Evaluation, Walton W C, McGraw Hill Book Company, 1978.

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III-Year-II Semester		L	T	P	C
		2	1	0	3
FOUNDATION ENGINEETRING (20CE6P02)					

Course Learning Objectives:

The objective of this course is:

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

Course Outcomes:

Upon the successful completion of this course:

1. The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.
2. The student must be able to compute the magnitude of the foundation settlement to decide the size of the foundation.
3. The student must be able to use the field test data and arrive at the bearing capacity.
4. The student must be able to design Piles based on the principles of bearing capacity.

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

UNIT – II Stability of Slopes: Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, Taylor's and Bishop and standard method of slices

Earth Retaining Structures: Rankine's & Coulomb's theory of earth pressure – Culman's graphical method - earth pressures in layered soils.

UNIT-III Shallow Foundations – Bearing Capacity Criteria: Types of foundations and factors to be considered in their location - Bearing capacity – criteria for determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods. Settlement Criteria: Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – Types of

foundation settlements and their determination - allowable settlements of structures.

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

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

Text Books:

1. Principles of Foundation Engineering, Das, B.M., (2011), 6th edition Cengagelearning

2. Basic and Applied Soil Mechanics, Gopal Ranjan & A.S.R. Rao, New Age International Pvt. Ltd, (2004).

References:

1. Foundation Analysis and Design, Bowles, J.E., (1988), 4th Edition, McGraw-Hill Publishing Company, Newyork.

2. Analysis and Design of Substructures by Swami Saran, Sarita Prakashan, Meerut.

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III-Year-II Semester		L	T	P	C
		2	1	0	3

BRIDGE ENGINEERING (20CE6P02A)

Course Objectives:

The objective of this course is:

1. Familiarize Students with different types of Bridges and IRC standard.
2. Equip student with concepts and design of Slab Bridges, T Beam Bridges, and Box Culverts.
3. Familiarize with different methods of inspection of bridges and maintenance.

Course Outcomes:

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

CO1 Explain different types of Bridges with diagrams and Loading standards

CO2 Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing

CO3 Design and check the stability of piers and abutments.

CO4 Organize for attending inspections and maintenance of bridges and prepare reports

UNIT-I Introduction- Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, pre-stressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading.

UNIT-II Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method– Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method.

UNIT-III T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, Longitudinal girders, Secondary beams- Reinforcement detailing.

UNIT-IV Box Culverts: Loading – Analysis and Design- Reinforcement detailing.

UNIT-V Sub structure- Abutments- Stability analysis of abutments- piers-loads on piers- Analysis of piers-Wing walls-Design problems.

Text Book

1. Essentials of Bridge Engineering, Jhonson Victor D
2. Design of Bridge Structures, T. R. Jagadeesh, M.A. Jayaram, PHI
3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill

References:

1. Design of Concrete Bridges, Aswini, Vazirani, Ratwani.
2. Design of Steel Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications
3. Design of R C Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications.

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III-Year-II Semester		L	T	P	C
		3	0	0	3

ENVIRONMENTAL AND INDUSTRIAL HYGIENE (20CE6P02B)

Course objectives:

1. To communicate the importance of institutional sanitation in maintaining public health.
2. To introduce the strategies for maintaining healthy living and working environment.
3. To delineate the role of environmental engineer in industrial environments.

Course Outcomes:

The students will be able to

CO1: Identify the common communicable diseases and the solutions for controlling them.

CO2: Suggest appropriate sanitation measures for water supply and sanitation in un-sewered areas

CO3: Describe the process of refuse disposal in rural areas

CO4: Draw out the procedures adopted for maintaining hygiene in institutional buildings

CO5: Introduce the notion of occupational health, safety and the related management approaches.

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 – Creating

UNIT I

Epidemics, Epizootics:

Origin and spread of Communicable diseases like Cholera, Smallpox, Tuberculosis, Malaria, Filaria, and Plague, common methods (nose, throat, intestinal discharges) – Role of Public Health Engineering in the preventive aspects of the above diseases –Role of vectors in transmitting diseases and Rodent control methods.

UNIT II

Rural water supply and Sanitation:

Sanitary protection of wells, springs, economic methods of treatment – Excreta disposal systems – Types of sanitary privies.

UNIT III

Refuse Sanitation:

Quality and quantity of garbage, rubbish, ashes, street sweepings, night soil; methods of conveyance and sanitary disposal methods, latest technologies adopted to dispose off the solid wastes.

UNIT IV

Food Hygiene and Sanitation:

Milk and milk products, sanitary maintenance of catering, establishment, measures – Sanitary requirements and maintenance of the public utility services like schools, hospitals, offices and in other public buildings.

UNIT V

Ventilation, Air Conditioning And Light :

Composition of ambient air, air pollutants, bacteria, odours – Effective Temperature – Comfort

standards of ventilation, air interchange, natural ventilation, artificial ventilation, air conditioning – Measurement of light, illumination standards, natural lighting, artificial lighting.Occupational Health and Safety:
Occupational hazards in public buildings, schools, hospitals, eating establishments, swimming pools – Cleanliness and maintenance of comfort – Industrial plant sanitation – OHSAS 18001 and the WELL Building Standard and rating for built environment.

TEXT BOOKS:

1. Municipal and Rural Sanitation, Victor M.Ehlers, Ernest W. Steel, 6th Edition, McGraw Hill
2. Environmental Sanitation, Joseph A. Salvato, Nelson L. Nemerow, Franklin J. Agardy , 5th Edition, John Wiley and Sons
3. OHSAS 18001 Manual 4. WELL Rating System Manual

REFERENCES:

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen, Samuel A Vigil,McGraw Hill.
2. Not in my backyard – Solid Waste Management in Indian Cities, Sunita Narain, Jain Book Agency.
3. National Building Code of India, Bureau of Indian Standards

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III-Year-II Semester		L	T	P	C
		3	0	0	3

INTELLIGENT TRANSPORTATION SYSTEM (20CE6P02C)

Course objectives:
The main objectives are

4. To know the fundamentals of ITS
5. To study sensor technologies and Data requirements of ITS
6. To know ITS functional areas and user services
7. To study various kinds of ITS architecture
8. To study ITS applications in various fields of transportation engineering

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

CO1 Identify the benefits of ITS from various types.
CO2 Determine various sensor applications and ITS data collection techniques.
CO3 Identify ITS user services and functional areas.
CO4 Determine various ITS models, evaluation methods and ITSplanning.
CO5 Determine the suitable ITS technology and assess its effectiveness to solve transportation Problems.

Unit–1: Fundamentals of ITS: Definition of ITS's, The historical context of ITS from both public policy and market economic perspectives, Types of ITS; Historical Background, Benefits of ITS.

Unit–2: Sensor technologies and Data requirements of ITS:
Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Application of sensors to Traffic management; Traffic flow sensor technologies; Transponders and Communication systems; Data fusion at traffic management centres; Sensor plan and specification requirements; Elements of Vehicle Location and Route Navigation and Guidance concepts; ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), GIS, video data collection.

Unit–3: ITS functional areas and User Needs & Services:
ITS functional area: 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).
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–4: ITS Architecture:
Regional and Project ITS architecture; Concept of operations; ITS Models and Evaluation Methods; Planning and human factor issues for ITS, Case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, ITS planning.

Unit–5: ITS applications:
Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS & road pricing; Transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions

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 books:

2. Fundamentals of intelligent transportation systems planning ByMashrur A. Chowdhury, Adel WadidSadek
3. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.

Reference books:

4. B Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
5. National ITS Architecture Documentation, US Department of Transportation, 2007.

e-resources:

2. https://www.freebookcentre.net/maths-books-download/Linear-Algebra-A-free-Linear-Algebra-Textbook-and-Online-Resource.html

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III-Year-II Semester		L	T	P	C
		3	0	0	3
ELEMENTS OF CIVIL ENGINEERING (OE3201A)					

Course Objectives:

The objectives of this course are to make students to learn about

1. Basics of Civil Engineering concepts
2. The surveying, elevations and mapping
3. The construction materials and elements
4. Water resource development

Unit-I **12 HOURS**

Scope of Civil Engineering: **Introduction**: Impact of Infrastructural Development on the Economy of a Country, Role of Civil Engineers, Importance of Planning, Scheduling and Construction Management.

Surveying: Introduction: Surveying and levelling, Object and uses, Primary divisions, Fundamental principles, Classification of surveying, Plans and maps, Scales, Units of measure.

Unit-II **14 HOURS**

Compass surveying:

Types and uses of compass, Bearings, Whole Circle Bearings, and Reduced Bearings, Computation of angles; Meridians; declinations and dip of needle; Local attraction; compass surveying field work.

Elevation measurements:

Levelling, object and uses, terms used in levelling, levelling instruments, methods of levelling, recording and methods of reducing, errors in levelling, contours; characteristics and applications.

Modern Tools of Surveying and Mapping:

Introduction to Theodolite, Electronic Distance Measurement Instruments, Total Station, Global Positioning System, Remote Sensing and Geographic Information System.

Unit-III **10 HOURS**

Construction Materials Requirement, types, uses, properties and importance of Civil Engineering materials like Stone, Bricks, Lime, Cement, Ferrous and Non-Ferrous Metals, Ceramic Materials,

Timber, Sand, Aggregate, Mortar and Concrete, Paints and Varnishes, Glass, Plastic, Conducting, Magnetic, and Miscellaneous Materials.

Unit-IV **10 HOURS**

Elements of Building Construction:

Planning: Elementary principles and basic requirements of a building planning, layout of residential & industrial buildings.

Construction: Classification of buildings based upon occupancy and structure, Design Loads, Common building components, their functions, and nominal dimensions. Elements of building drawing. Introduction to building byelaws.

Unit-V **10 HOURS**

Water Resources Development Elementary:

Hydrology, Sources of water, Watershed Development, water requirements and its conservation, Hydraulic Structures of Storage, Water Conveyance System: Canals; Water Conduits.

TEXT BOOKS:

1. Surveying Vol. I & II, Dr. B. C. Punamia Laxmi Publication, Delhi

2. Building Construction, Dr. B. C. Punamia Laxmi Publication, Delhi

3. Engineering Material, Dr. S.C. Rangwal, Charotar Pub. House

4. Irrigation Engineering and Hydraulic Structures, Santoshkumar Garg, : Khanna Publishers Delhi

5. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition

REFERENCE BOOKS:

1. Civil Engineering Material, Jakson and Dhir, ELBS Publishing London

2. Civil Engg. Drawing, S. C. Rangwal, Charotar Pub. House Anand

III-Year-II Semester		L	T	P	C
		3	0	0	3

GEO-SPATIAL TECHNOLOGIES (OE3201B)

Course Objectives:

1. To understand the fundamentals of GIS and Coordinate systems
2. To study about data acquisition and data management process.
3. To impart knowledge about the data modeling and GIS analysis and its functions
4. To deal with the various applications of GIS in Civil Engineering
5. To give an introduction about remote sensing and its applications

Course Outcomes:

The students will be able to

CO1: To understand and remember the concepts of GIS, Projections and Coordinate systems

CO2: To classify and explain various data acquisition and data management techniques.

CO3: To study, model and analyze various data collected.

CO4: To apply the knowledge of GIS in Civil Engineering stream

CO5: To understand the concepts of Remote sensing and its applications.

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT –I **10 HOURS**

Introduction – Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems.

Projections and Coordinate Systems – Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations, map analysis.

UNIT –II **10 HOURS**

Data Acquisition: Data Types, Spatial, Non-Spatial (Attribute) Data, Data Format – Vector and Raster Data, Manual Digitizing, Scanner, Aerial Photographic Data, Remotely Sensed Data, Digital Data, Cartographic Database, Digital Elevation Data.

Data Management: Data Storage and Maintenance, Data Compression, Data Quality and Standards, Precision, Accuracy, Error **–** Geometric errors and corrections, Radiometric errors and corrections, types of Systematic and Non-systematic errors.

UNIT –III **12 HOURS**

Data Modeling: Spatial Data Analysis, Data Retrieval Query, Simple Analysis, Recode Overlay, Vector Data Model, Raster Data Model, Digital Elevation Model, Cost and Path Analysis, Knowledge Based System.

GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non-spatial data.

UNIT –IV **12 HOURS**

Applications of GIS: Environmental and Natural Resource Management, Soil and Water Resources, Agriculture, Land Use Planning, Geology and Municipal Applications, Urban Planning and Project Management, GIS for decision making under Uncertainty, standard GIS packages, Introduction to Global Positioning Systems (GPS) and its applications.

UNIT – V **12 HOURS**

Introduction to Remote Sensing: General background of Remote Sensing Technology, Objectives and Limitations of Remote Sensing, Electro-Magnetic Radiation, Characteristics, Interaction with Atmosphere and Earth Surface, Remote Sensing Platforms and Sensors, Satellite Characteristics, Digital Image Processing, IRS Series and High Resolution Satellites, Remote Sensing Applications to Watershed Modeling, Environmental Modeling, Urban Planning and Management.

TEXT BOOKS:

1. Demers, M.N, (2013). *'Fundamentals of Geographic Information Systems'* Wiley India Pvt. Ltd,.
2. Burrough, P. A., and McDonnell R. A. (1998). *Principles of Geographical Information Systems.* Oxford University Press, New York.
3. Kang-tsung Chang. (2006). *Introduction to Geographical Information Systems.* Tata McGraw- Hill Publishing Company Ltd., Third Edition, New Delhi.
4. George Joseph, (2013). *'Fundamentals of Remote Sensing'* Universities Press.

REFERENCE BOOKS:

1. Sabins F.F. Jr. (1978). *Remote Sensing Principles and Interpretations.* W.H. Freeman and Company, San Francisco.
2. Tor Bernhardsen. (2002). *Geographical Information System.* Wiley India (P) Ltd., Third Edition, New Delhi.
3. Hoffman-Wellenhof, B, et al. (1997). *GPS Theory and Practice.* Fourth Edition, Springer Wein, New York.
4. Lilysand T.M., and Kiefer R.W. (2002). *Remote Sensing and Image Interpretation.* John Wiley and Sons, Fourth Edition, New York.
5. Choudhury S., Chakrabarti, D., and Choudhury S. (2009). *An Introduction to Geographic Information Technology.* I.K. International Publishing House (P) Ltd, New Delhi.

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III-Year-II Semester		L	T	P	C
		0	0	3	1.5
STAAD LABORATORY (20CE6L01)					

Course Objectives:

To analyze and design various structures using STAAD Pro / STAAD Foundation softwares.

Course Outcomes:

At the end of the course the students can able to

CO1: Analyze continuous beam and plane frame

CO2: Analyze and design 3-D RC frames for gravity loading.

CO3: Analyze and design RC Slabs, Box Culverts and Footings.

CO4: Analyze and design steel trusses

CO5: Analyze and design Steel Pre-Engineered Building Frame.

LIST OF EXPERIMENTS

1. Analysis of Continuous Beam
2. Analysis of Plane Frame
3. Analysis and Design of 3-D RC Frame subjected to gravity loading.
4. Analysis and Design of Beam-Supported RC Slab
5. Analysis and Design of 2-D Steel Truss
6. Analysis and Design of 3-D Steel Truss
7. Analysis and Design of RC Box Culvert
8. Analysis and Design of Steel Pre-Engineered Building Frame
9. Analysis and Design of Isolated Column Footing
10. Analysis and Design of Raft Footing

Note: A minimum of 7 experiments must be dealt

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III-Year-II Semester		L	T	P	C
		0	0	3	1.5

GEOTECHNICAL ENGINEERING LABORATORY (20CE6L02)

Course Objectives:

1. To obtain index properties of locally available soils
2. To obtain engineering properties of locally available soils,
3. To understand the behavior of different soil behaviors under various situations.

Course Outcomes:

At the end of the course, the student will be able to:
CO1: Identify index properties of soils for classification purposes
CO2: Estimate the soil permeability
CO3: Determine the settlement characteristics of soils
CO4: Determine the compaction characteristics of soils
CO5: Estimate the strength parameters of soils

Note: A minimum of **10** experiments are to be performed from the following

List of Experiments:

1. Sieve Analysis
2. Sedimentation Analysis
3. Specific Gravity Test
4. Field density- Core cutter and Sand Replacement Methods
5. Atterberg's Limits.
6. Permeability of soil using Constant Head test and Variable Head test
7. Compaction Test
8. CBR Test
9. Consolidation Test (Demonstration)
10. Unconfined Compression Test
11. Direct Shear Test.
12. Vane Shear Test
13. Triaxial Test(UU)

TEXT BOOK/REFERENCE

Laboratory manual prepared by Civil Engineering Department

TEXT BOOKS:

1. American Public Health Association, "Standard Methods for Analysis of Water and Wastewater", APHA, Washington, 1992.
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi, 2010.
3. Laboratory Manual developed by Civil Engineering Department.

REFERENCES:

1. IS 2720 all parts.
2. IS 9198-1979, Specification for compaction hammer for soil testing.
3. IS:10074-1982, Specification for compaction mould assembly for light and heavy compaction test for soils.
4. Braja.M.Das, "Geotechnical Engineering Handbook", Cengage Learning, 1st Edition, 2014.

III-Year-II Semester		L	T	P	C
		1	0	2	2

SKILL ADVANCED COURSE 2 - REVIT ARCHITECTURE AND ENERGY ANALYSIS (20CE6E01)

Course objectives:
The main objectives are
1. Learn the usage of Revit software for planning
2. Learn the 3D modeling of buildings
3. Learn the Energy analysis of a building using Revit software

Course Outcomes:
Upon successful completion of the course, the student will be able to
CO1: To understand the importance of Revit Software in planning and Design of Buildings
CO2: To Plan and model various types of buildings
CO3: To analyze the buildings in Insight for Energy analysis

List of Experiments:
18. Draw the Plan, Section and Elevation and 3D modeling of a two bed room house
19. Draw the Plan, section and Elevation and 3D modeling of a MIG house
20. Draw the Plan, Section and Elevation and 3D modeling of an Educational building
21. Plan, Section and Elevation and 3D modeling of a Hotel/Motel building
22. Plan, Section and Elevation and 3D modeling of a Hospitals/Dispensaries building
23. Draw the 3D modelof a given Layout using Revit
24. To allot various Energy Parameters base on room to a modeled building
25. To analyze the building using Insight plugin from REVIT
26. To modify the existing building for better energy efficiency
27. To convert the model to gbxml and to analyze the building in Green building studios

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III-Year-II Semester		L	T	P	C
		1	0	2	2
SKILL ADVANCED COURSE 2- OPEN ROADS (20CE6E01A)					

Course Objectives:

The main objectives are

1. Learn the usage of Open Roads software for planning
2. Learn to model and analyze the earth work.
3. Learn to use the Open Roads software to address the societal engineering problems.

Course Outcomes:

CO1: The course covers different elements from Transportation Engineering

CO2: In this course, the student will be able to analyze the various cross sectional elements in Road/pavement construction.

CO3: Students will be able to design the various elements in pavement design.

CO4: Students will be able to design and model the sewerage networks.

List of Experiments:

1. Automate the drawing production.
2. Create horizontal & vertical alignments, profiles and cross sections.
3. Model and analyze the terrains
4. Model and analyze the earthwork.
5. Model, Analyze and design of storm water and sanitary sewer networks.

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III-Year-II Semester		L	T	P	C
		2	0	0	0

ENTREPRENEURIAL SKILLS DEVELOPMENT (20SH6N01)

Course Objective:

1. To impart the basic knowledge of entrepreneurship skills for better understanding of entrepreneurial scenario.
2. To understand the knowledge of theories of entrepreneurship and to motivate students to become entrepreneur.
3. To identify opportunities in starting own ventures.
4. To understand and plan business model for a start up.
5. To analyze the role of government and non government institutions in supporting entrepreneurial activities.

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

CO 1: The basics of entrepreneurship skills for better understanding of entrepreneurial scenario are understood.

CO 2: Apply Knowledge of theories of entrepreneurship and to identify entrepreneurial opportunities for women.

CO 3: identify opportunities supporting entrepreneurship.

CO 4: analyze the milestones and related challenges in developing new venture.

CO 5: Understand government role supporting entrepreneurship.

Unit 1

Foundation of Entrepreneurship 10 hrs

Concept and Need of Entrepreneurship; Characteristics and types of Entrepreneurship; Charm of becoming Entrepreneur; Entrepreneurial decision process; Entrepreneurship as a career; Entrepreneurship as style of management; Changing role of Entrepreneur; Entrepreneurial traits, factors effecting Entrepreneur.

Unit 2

Theories of Entrepreneurship and Entrepreneurial motivation 12 Hrs

Influences of Entrepreneurship development; external Influences of Entrepreneurship development; Socio – cultural, political and economical, personal entrepreneurial success and failure: reason and remedies, women entrepreneurs: challenges and achievements of women entrepreneurs.

Meaning of Entrepreneurial motivation; motivation cycle or process; theories of Entrepreneurial motivation; Entrepreneurial motivational factors, Changes in Entrepreneurial motivation.

Unit 3

Opportunities Identification and Selection 10 Hrs

Need for opportunities identification and selection; Environmental Dynamics and Changes; Business Opportunities in various sectors; Identification of Business opportunities, and Opportunity selection.

Unit 4

Business Planning Process 10 Hrs

The business plan as an entrepreneurial tool; Elements of business planning; Objectives; Market analysis; Development of product/idea; Marketing, Finance, organization and management; Ownership; Critical risk contingencies of the proposal; Scheduling and milestones.

Unit 5

Entrepreneurial Development and Government 10 Hrs

Role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, programmed schemes and challenges, Government initiatives and inclusive entrepreneurial growth.

TEXT BOOKS:

1. Khanna, S. S., Entrepreneurial Development, S. Chand, New Delhi.
2. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
3. P.Narayana Reddy, Entreprenurship, Cengage Learning, New Delhi,2010.
4. Steven Fisher, Ja-nae Duane, The startup equation – A visual guide book for building your startup, Indian edition, McGraw Hill Education India Pvt. Ltd. 2016.
5. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.
6. VSP Rao, Kuratko: "Entrepreneurship', Cengage Learning, New Delhi, 2011.
7. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012.
8. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 2009.
9. Dollinger: Entrepreneurship, Pearson, 2009.

REFERENCE BOOKS:

1. Entrepreneurship, Arya Kumar, 4 e, Pearson 2015.
2. Entrepreneurship, a South – Asian Perspective, D.F. Kuratko and T. V. Rao, 3e, Cengage, 2012.
3. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.
4. AnajanRai Chaudhuri, Managing new ventures, concepts and cases, Prentice Hall International, 2010.
5. Rajeev Roy: Entrepreneurship, Oxford university press, New Delhi, 2010.

Web Resources:

1. https://nptel.ac.in/courses/110105067/50
2. http://www.yourarticlelibrary.com/project-management/5-methods-of-project-appraisalexplained/40771
3. https://springhouse.in/government-schemes-every-entrepreneur/
4. http://nptel.ac.in/courses
5. https://www.tutorialspoint.com/
6. https://www.ediindia.org/
7. http://www.quickmba.com/entre/

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IV-Year-I Semester		L	T	P	C
		2	1	0	3
ESTIMATION SPECIFICATION & CONTRACTS (PC4101)					

Course Objectives:

The objective of this course is to enable the students to:

1. Understand the quantity calculations of different components of the building.
2. Understand the rate analysis of different quantities of the building components.
3. Learn various specifications and components of the buildings.

Course Outcomes:

The students will be able to

CO1: prepare a Rough Cost Estimate for sanction or Approval of a Project/building.

CO2: determine the quantities of different components of buildings.

CO3: determine the quantity of Earthwork for Canals & Roads and prepare BBS.

CO4: find the cost of various building components/Items of work.

CO5: capable of finalizing the value of structures**.**

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

Unit-I:

General items of work in Building – Standard Units, Principles of working out quantities for – detailed and abstract estimates –Approximate methods of Estimating.

Unit– II:

Detailed Estimation of Buildings using Individual wall method and center line method.

Unit-III:

Rate Analysis – Working out data for various items of work–over head and contingent charges.

Unit-IV:

Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

Unit-V:

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation of buildings –Standard specifications for different items of building construction.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of SIX questions from Units 1,3,4,5 out of which THREE are to be answered (60% Weightage) & ONE mandatory question (40% Weightage) from Unit 2.

TEXT BOOKS:

1. Estimating and Costing, B.N. Dutta, UBS publishers, 2000.

2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press (India) Pvt. Ltd., Hyd.

3. Construction Planning and Technology, Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. Estimating and Costing, G.S.Birdie.

REFERENCE BOOKS:

1. Standard Schedule of rates and standard data book, Public worksdepartment.
2. IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil Engg Works –B.I.S.
3. Estimation, Costing and Specifications, M. Chakraborthi; Laxmipublications.
4. National Building Code

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IV-Year-I Semester		L	T	P	C
		2	1	0	3
WATER RESOURCES ENGINEERING (PC4102)					

Course Objectives:

The course is designed to:

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

Course Outcomes:

The students will be able to

CO1: ***quantify*** the major sources of precipitation and Develop Intensity – Duration- Frequency curve & Depth – Area Duration curves and carry out rainfall frequency analysis. (Analysing)

CO2: ***quantify*** various abstractions and apply the concepts to several practical areas of engineering hydrology (Understanding, Applying)

CO3: e***stimate*** the runoff and ***develop*** Unit Hydrographs and Synthetic Unit Hydrograph. (Applying, Analysing)

CO4: ***estimate*** flood magnitude and carry out flood routing (Applying, Analysing)

CO5: ***determine*** aquifer parameters and yield of wells (Analysing)

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

Unit-I:

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

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

Unit– II:

Abstractions from Precipitation: Initial abstractions.
Evaporation: factors affecting, measurement, reduction
Evapotranspiration: factors affecting, measurement, control
Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

Unit-III:

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

Hydrograph Analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph (UH), assumptions, derivation of UH, UH of different durations, principle of superposition and S-hydrograph methods, limitations and applications of UH, synthetic UH, instantaneous UH.

Unit-IV:

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

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

Unit-V:

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

TEXT BOOKS:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013),New Delhi.
3. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and ArunKumar Jain, Lakshmi Publications (P) Ltd.

REFERENCES:

1. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.
2. Applied hydrology, Chow V. T., D. R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd,(2011), New Delhi.
3. Water Resources Engineering, Mays L.W, Wiley India Pvt. Ltd, (2013).

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IV-Year-I Semester		L	T	P	C
		2	1	0	3

PRESTRESSED CONCRETE STRUCTURES (PE4102A)

Course Objectives:

1. Familiarize Students with concepts of prestressing
2. Equip student with different systems and devices used in prestressing
3. Understand the different losses of prestress including short and long term losses
4. Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion

Course Outcomes:

The students will be able to

CO1: Be able to understand the various terminology and requirements for prestressed concrete

CO2: Understand different methods of prestressing and analysing the section under loading condition

CO3: Estimate the effective prestress including the short and long term losses

CO4: Analyze and design of prestressed concrete beams under flexure, Shear and Torsion

CO5: Estimate the short and long term deflection and able to understand the transfer of presterss pre-tensioning and post tensioning members

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

Unit-I: Basic Concepts of Prestressing and Prestressing Systems

Basic concepts of Prestressing- History- Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Cover Requirements.

Unit– II: Prestressing Systems and Analysis of Prestressing

Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems,

Analysis of Prestress - Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

Unit-III: Losses of Pre-stressing

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation stress in steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design

Unit-IV: Design of Beams for flexure, shear and Torsion

Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure- Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

Unit-V: Deflection of Members and End Zone of Members

Deflection- Control of deflections- Factors influencing Deflection- Prediction of short term and long term deflections.

Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- end zone reinforcement- Codal provisions-

Transfer of Prestress in Post tensioned members Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

TEXT BOOKS:

1. Prestressed Concrete, N. Krishna Raju, Tata McGraw hill
2. Prestressed Concrete, S. Ramamrutham

REFERENCE BOOKS:

1. Prestressed Concrete, P. Dayaratnam
2. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

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IV-Year-I Semester		L	T	P	C
		2	1	0	3

SPECIAL GEOTECHNICAL CONSTRUCTION (PE4102B)

Course Objectives:

1. To teach the student the problems posed by expansive soils and the foundation practices appropriate to expansive soils.
2. To make capable of choosing and designing the appropriate method of Ground Improvement according to site conditions
3. To understand the in situ soil treatment methods
4. To understand designing criteria of reinforced earth retaining walls and gabion walls
5. To bring out concepts regarding Design of reinforced earth slopes

Course Outcomes:

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

CO1: Assess the foundation practices on expansive soils
CO2: Illustrate the mechanism of the soil nailing system
CO3: Perform the methods of stabilization of expansive soils
CO4: Design a Gabion wall
CO5: Design a stone column

UNIT-I

Foundation Practices in Expansive Clays – Sand cushion – Belled Piers – CNS layer technique Under – reamed pile foundations – Construction techniques – design specifications – Load - carrying capacity in compression and uplift of single and multi – under-reamed piles in clays and sands – granular pile Anchors.

UNIT-II

STONE COLUMNS: Design: basic design parameters – diameter, pattern/ configuration, spacing, replacement ratio, stress concentration factor, backfill, critical column length, failure mechanisms, load analysis, Priebe's Method.

UNIT-III

SOIL NAILING:

Introduction to soil nails, advantages, features, and limitations of a soil nail retaining system, applications, suitability of ground conditions for soil nailing, types of soil nails and their behavior, construction sequence of soil nailed slopes, rigs for installation of nails, drilling soil nail bores, placing nails, grouting the nails, categories of slope facing, fundamental mechanism and potential failure of a soil nail wall, nail-ground interaction, nail-ground-facing interaction (pullout resistance).

UNIT-IV

GABION WALLS: Applications, design philosophy and failure mechanisms, general design principles, key design analysis, materials used, specifications, installation procedure, stability analysis.

UNIT-V

Design of reinforced earth slopes: Basal reinforcement for construction on soft clay soils, construction of steep slopes with reinforcement layers on stable foundation soil, different slope Stability analysis, erosion control on slopes using geosynthetics.

TEXTBOOKS:

1. Das B.M., Shukla S.K., Earth Anchors, 2nd Ed., J. Ross Publishing, 2013.

2. Barksdale R.D., Bachus R.C., Design and construction of stone columns, Federal Highway Administration, RD-83/026, 1983.

REFERENCES:

1. Hsai Yang Fang, Foundation Engineering Handbook, 2nd Edition, Chapman & Hall, 1991

Inst. of Civil Engrs., Specification for piling and embedded retaining walls, 2nd Edition, Thomas Telford, 2007.

2. IS:15284-2003 Indian standard code of practice for design and construction for ground improvement guidelines. Part 1: Stone columns, Bureau of Indian Standards, 2003.

3. Lazarus White, Modern Underpinning - Development, Methods and Typical Examples, 4th Edition, Read Books, 2008.

4. Malcolm Puller, Deep Excavations: A practical manual, 2nd Edition, Thomas Telford,2003.

5. Priebe H.J., Vibro Replacement—Design Criteria and Quality Control, ASTM STP 1089— Deep foundation improvements-Design, Construction and Testing, 1991.

6. Thornburn S., Littlejohn G.S., Underpinning and Retention, 1st Edition, SpringerScience, 1993.

IV-Year-I Semester		L	T	P	C
		3	0	0	3

SOLID WASTE MANAGEMENT (PE4102C)

Course Objectives:

1. To impart the knowledge the methods of collection and optimization of collection routing of municipal solid waste
2. To acquire the principles of treatment of municipal solid waste
3. To know the impact of solid waste on the health of the living beings
4. To learn the criterion for selection of landfill and its design
5. To plan the methods of processing such as composting the municipal organic waste

Course Outcomes:

The students will be able to

CO1: Design the collection systems of solid waste of a town

CO2: Design treatment of municipal solid waste and landfill

CO3: Know the criteria for selection of landfill

CO4: Characterize the solid waste and design a composting facility

CO5: Know the Method of treatment and disposal of solid waste materials

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

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 - materials separation 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, New Delhi,2004.
2. Solid and Hazardous Waste Management PM Cherry, CBS Publishers and Distributors. New Delhi,2016.
3. Solid Waste Engineering, William A Worrell, P AarueVesilind, Cengage Learning, New Delhi2016.

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IV-Year-I Semester		L	T	P	C
		2	1	0	3

PAVEMENT ANALYSIS AND DESIGN (PE4102D)

Course Objectives:

1. Familiarize Students with concepts of pavement design.
2. Equip student with different pavement deflection measurement techniques.
3. Understand the different types of stresses developed in the pavements.
4. Familiarize students with the analysis and design of flexible pavements, rigid pavements and overlays also.

Course Outcomes:

The students will be able to

CO1: Analyze the various design factors required for design of pavements

CO2: Apply the concept of different types of stresses developed due to wheel loads and temperature variations.

CO3: Estimate the thickness of pavements by design methods

CO4: Estimate the measurement and analysis of Roughness measurements and pavement distress

CO5: Apply the concept of pavement deflection estimation.

Unit-I: Pavement Types, Wheel Loads and Design Factors

Definition of Pavement and Types-Comparison of Highway pavements-Wheel Loads- Tyre pressure, Contact pressure, Design Factors: Traffic and Loading, Environment, Materials, Failure criteria, Reliability.

Unit– II: Stresses in Pavements

Layered System Concepts: One Layer System: Boussinesq Theory- Two Layer Theory: Burmister's Theory -Three Layer System. Stresses in Rigid Pavements - Relative Stiffness of Slabs, Modulus of Sub grade Reaction - Stresses due to Warping, Stresses due to Friction, Stresses due to Load, IRC Recommendations.

Unit-III: Pavement Design

IRC Method of Flexible Pavement Design, AASHTO Method of Flexible Pavement Design, IRC Method for Rigid Pavements, use of Geosynthatics in pavements.

Unit-IV: Pavement Inventories

Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Measurement of Distress Modes Cracking, Rutting, Rebound Deflection using Benkleman Beam Deflection Method, Load Man Concept, Skid Resistance Measurement.

Unit-V: Deflection measurements and Design of Overlay

Beam Deflection Method, Pavement Distress Rating Technique. Design of Overlays by Benkelmen Beam Deflection Methods as per IRC – 81 - 1997 – pavements on problematic soils.

TEXT BOOKS:

3. Yoder and Witzorack, "Principles of Pavement Design", John Willey and Sons.
4. Yang, H. Huang, "Pavement Analysis and Design", Prentice Hall Publication, Englewood Cliffs, New Jersy.

REFERENCE BOOKS:

1. Ralps Hass and Hudson, W.R. " Pavement Management System" Mc-Graw Hill Book Company.
2. IRC codes of practice.

IV-Year-I Semester		L	T	P	C
		3	0	0	3
URBAN HYDROLOGY (PE4102E)					

Course Objectives:

The course is designed to:

- Appreciate the impact of urbanization on catchment hydrology.
- Understand the importance of short duration rainfall runoff data for urban hydrology studies.
- Learn the techniques for peak flow estimation for storm water drainage system design.
- Understand the concepts in design of various components of urban drainage system.
- Learn some of the best management practices in urban drainage.
- Understand the concepts of preparation master urban drainage system.

Course Outcomes:

The students will be able to

- Appreciate and articulate the multifaceted effects of urbanization on catchment hydrology, including alterations in runoff patterns, infiltration, and stream flow dynamics.
- Analyze and interpret short duration rainfall runoff data to understand how intense rainfall events impact urban hydrology.
- Adept at applying various peak flow estimation techniques for storm water drainage system design.
- Conceptualize and design essential components of urban drainage systems, including storm water collection networks, retention basins, and detention structures.
- Identify, evaluate, and implement a range of best management practices in urban drainage.

Unit-I:

INTRODUCTION: Urbanization and its effect on water cycle – urban hydrologic cycle – Trends in urbanization – Effect of urbanization on hydrology

Unit– II:

PRECIPITATION ANALYSIS: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration -Frequency (IDF) curves, design storms for urban drainage systems.

Unit-III:

APPROACHES TO URBAN DRAINAGE: Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and stormwater reuse, major and minor systems.

Unit-IV:

**ELEMENTS OF DRAINAGE SYSTEMS:: ** Open channel, underground drains, appurtenances, pumping, and source control.

Unit-V:

ANALYSIS AND MANAGEMENT: Stormwater drainage structures, design of stormwater network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for stormwater management.

TEXT BOOKS:

1. Manual on Drainage in Urbanised area, Geiger W. F., J Marsalek, W. J. Rawls and F.C. Zuidema, (1987 - 2 volumes), UNESCO,
2. Urban Hydrology, Hall M J (1984), Elsevier Applied Science Publisher.
3. Hydrology – Quantity and Quality Analysis, Wanielista M P and Eaglin (1997), Wiley and Sons
4. Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling, Akan A.O and R.L. Houghtalen (2006), Wiley International.

REFERENCES:

1. Stormwater Detention for Drainage, Stahre P and Urbonas B (1990), Water Quality and CSO Management, Prentice Hall.
2. Urban water cycle processes and interactions, Marsalek et. al. (2006), Publication No. 78, UNESCO, Paris(http://www.bvsde.paho.org/bvsacd/cd63/149460E.pdf)
3. Frontiers in Urban Water Management – Deadlock or Hope, by Maksimovic C and J A Tejada-Guibert (2001), IWA Publishing.

IV-Year-I Semester		L	T	P	C
		2	1	0	3
ADVANCED DESIGN OF STEEL STRUCTURES (PE4103A)					

Prerequisites:

1. Design and Drawing of Steel Structures

Course Objectives:

The objective of this course is to:

- Familiarize Students with different types of framed connections
- Equip student with concept of plastic analysis
- Impart knowledge on design of gantry girder and plate girders
- Familiarize student with various types of building systems
- Expose students to composite design

Course Outcomes:

At the end of successful completion of this course, the student will be able to

CO1: Analyze and design Framed Connections

CO2: Carryout plastic analysis of continuous beams and portal frames

CO3: Analyze, Design & Detail Gantry Girder and Plate Girder

CO4: Gain practical knowledge on Conventional and Pre-Engineered building systems

CO5: Design Composite Beams as per limit state design and provide Detailing

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Evaluating, 6 - Creating

UNIT – I

Framed Connections: Classification of simple and moment resistant connections**;** Web – Angle connection; Stiffened seat connection; Beam-Beam splice and End plate connection.

UNIT – II

Plastic Analysis: Yielding and Plasticity; Idealized stress-strain curve; Methods and theorems; Ultimate load; Load factor; plastic hinge; plastic section modulus; Shape factor; Analysis of three span continuous beam, Analysis of single storey non-sway and sway portal frames

UNIT – III

Gantry Girder: EOT cranes; Loads on Gantry Girders; Load combinations; Design of Simply Supported Gantry Girder.

Plate Girder: Un-stiffened and stiffened plate girders; Behaviour of transversely stiffened plate girders – Buckling, Post-Buckling and Collapse stages; Simple Post-Critical method and Tension-Field method; Design provisions as per IS 800:2007; Design of transversely stiffened plate girder

UNIT –IV

Single Storey Building Frames: Sway and Non-sway frames; Effective length of columns as per Annexure-D of IS 800:2007 for portal frames.

Pre-Engineered Buildings: Introduction; Dead, Live and Wind load calculation for Gable Frames; Design of Tapered Rafter and Column Members.

Multi Storey Building Frames: Types of frames; Types of floors; Effective length of columns in multi-storey building frames: Braced and Un-braced; Determination of gravity loads on beams and columns.

UNIT – V

Limit State Design of Composite Beam (As per IS 11384-1985, IS 456:2000 and IS 800:2007): Introduction; Methods of construction; Shear Connectors; Limit State of Collapse: Flexure, Horizontal Shear and Vertical separation of slab; Limit State of Serviceability; Design of composite beam.

The students should prepare the following plates.

Plate 1 Detailing of Framed Connections
Plate 2 Detailing of Gantry Girder
Plate 3 Detailing of Plate Girder,
Plate 4 Detailing of Pre-Engineered Building Frame
Plate 5 Detailing of Composite Beam

FINAL EXAMINATION PATTERN:

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

TEXT BOOKS

1) N. Subramanian, Design of Steel Structures, Oxford University Press (India), 2015
2) K. S. Sai Ram, Design of Steel Structures, Pearson Education (India), 2020

REFERENCES / FURTHER READING

1) Teaching Resource for Structural Steel Design, INSDAG
2) L. J. Morris and D.R. Plum, Structural Steel Work Design to BS 5950, Prentice-Hall, 1996
3) D. Lam et al., Structural Steelwork: Design to Limit State Theory (BS 5950), CRC press, 2004

IS Codes:

1) IS 800:2007, Indian Standard Code for General Construction in Steel, 3rd revision, BIS, New Delhi.
2) IS 875 Parts I- III, Code of practice for design loads (other than earth quake) for buildings and Structures, BIS, New Delhi.
3) IS 456 – 2000, Plain and Reinforced Concrete – Code of Practice, BIS
4) IS 11384-1985, Code of Practice for Composite Construction in Structural Steel and Concrete, BIS, New Delhi.
4) Steel Tables

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

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IV-Year-I Semester		L	T	P	C
		2	1	0	3

GROUND IMPROVEMENT TECHNIQUES (PE4103B)

Course Learning Objectives:

The objective of this course is:

1. To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remolded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. To enable the students to know how geotextiles and geosynthetics can be used to improve the engineering performance of soils.
4. To make the student learn the concepts, purpose, and effects ofgrouting.

Course Outcomes:

a. By the end of the course, the student should be able to possess knowledge of various methods of ground improvement and their suitability to different field situations.
b. The student should be in a position to design a reinforced earth embankment and check its stability.
c. The student should know the various functions of Geo-synthetics and their applications in Civil Engineering practice.
d. The student should be able to understand the concepts and applications of grouting.

UNIT- I

In situ densification methods- in situ densification of granular soils- vibrationat the ground surface and at depth, impact at the 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 the choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

UNIT- IV

Geosynthetics – geotextiles – types – functions, properties and applications – geogrids, geomembranes, and gabions - properties and applications.

UNIT-V

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – postgrout tests

TEXTBOOKS:

1. 'Ground Improvement Techniques' by Purushotham Raj, LaxmiPublications, New Delhi.
2. 'Ground Improvement Techniques' by Nihar Ranjan Patro, VikasPublishing House (P) Limited, New Delhi.
3. 'An introduction to Soil Reinforcement and Geosynthetics' byG.L.Siva Kumar Babu, Universities Press.
4. Engineering Principles of Ground Modification by Manfred R. Hausmann

REFERENCE BOOKS:

1. 'Ground Improvement' by MP Moseley, Blackie Academic andProfessional, USA.
2. 'Designing with Geo-synthetic's by RM Koerner, Prentice Hall.

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IV-Year-I Semester		L	T	P	C
		3	0	0	3

ENVIRONMENTAL IMPACT ASSESSMENT (PE4103C)

Course Objectives:

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 14001certification
5. To know the procedures for environmental clearances and audit
6. To appreciate the importance of stakeholder participation in EIA

Course Outcomes:

The students will be able to

CO1: Prepare EMP, EIS and EIA report, estimate cost benefit ratio of a project

CO2: Selection of an appropriate EIA methodology

CO3: Evaluation of impacts on environment

CO4: Evaluation of risk assessment

CO5: Know the latest acts and guidelines of MoEF & CC

UNIT I

Basic concept of EIA:

Elements of EIA-factors affecting EIA-Initial environmental Examination-life cycle analysis preparation of Environmental Base mapClassification of environmental parameters – role of stakeholders in the EIA preparation – stages in EIA

UNIT II

E I 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. 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 IV

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation. Environmental Risk Assessment and Risk management in EIA: Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment advantages of

Environmental Risk Assessment

UNIT V

EIA notification by Ministry of Environment and Forest (Govt. of India):

Provisions in the EIA notification, procedure for environmental clearance, and procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO14000. Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar,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., NewDelhi.
3. Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

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IV-Year-I Semester		L	T	P	C
		3	0	0	3

TRANSPORTATION ECONOMICS (PE4103D)

Course Objectives:

1. Understand the concept of investment policies.
2. Equip student with different types of transportation systems in urban and regional levels.
3. Understand the concept cost analysis and traditional economical analysis.
4. Familiarize students with the concept of Quality Management.

Course Outcomes:

The students will be able to

CO1: Analyze the concept of Economic analysis and user costs.

CO2: Apply different types of costs and allocation of resources.

CO3: Estimate the transport planning techniques and different types of costs.

CO4: Analyze the concept of life cycle cost analysis.

CO5: Estimate the techniques to obtain total quality management in a highway project.

UNIT-I TRANSPORT ECONOMICS AND ANALYSIS:

Review of Engineering Economics and Microeconomics, Welfare Theory and Equilibrium Conditions, Goals and Objectives, Principles of Economic Analysis. Discounted Cash Flows: Analysis of User Costs and Benefits, RUCS Models for Costs and Benefits, Methods of Economic Analysis; Suitability, Analysis for Null Alternative

UNIT-II INVESTMENT POLICIES AND PRICING:

Average Cost, Marginal Cost, Allocation of Resources within Transport Sectors, Financing of Transport Sectors, Transport Investment Policies - Pricing Policies. Issues in transport policy: Budgeting, Non-user Impact Analysis, Analysis of Related Endeavour, Monitoring and Continuous Evaluation Strategies, Case Studies.

UNIT-III SYSTEM SELECTION, EVALUATION:

Framework of Evaluation, Transport Planning Evaluation at Urban and Regional levels, Other Evaluation Procedures - Traditional Economic Analysis, Achievement Matrices, Factor Profiles, Plan Ranking, Introduction to Mathematical Programming, Case Studies.

UNIT-IV COST ANALYSIS:

Life cycle cost analysis: Factors consider for Life Cycle Cost Analysis; Data requirements for highway project feasibility analysis, establishment of Technical/ Economic/ Financial feasibility of a highway project, Social Benefits, Role of HDM in feasibility studies.

UNIT-V TQM IN HIGHWAY PROJECTS:

Need for TQM, TQM Principles, Phases in TQM - Conceptual stage to Operations staqe, TQM in Traffic & Transportation projects, Case Studies.

TEXT BOOKS:

1. Highway investment in Developing countries - Thomas Telford Ltd., Institute of Civil Engineers
2. Winfrey R, Economic Analysis for Highways - International Text Book Co., Pennsylvania

REFERENCE BOOKS:

1. Road User Cost Study - Final Report - Central Road Research Institute, New Delhi
2. Dickey, J.W. - Road Project Appraisal for Developing countries, John Wiley and Sons.
3. lan Heggie, Transport Engineering Economics,

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IV-Year-I Semester		L	T	P	C
		2	1	0	3
IRRIGATION AND HYDRAULIC STRUCTURES (PE4103E)					

Course Objectives:

The course is designed to:

- Introduce the types of irrigation systems
- Introduce the concepts of planning and design of irrigation systems
- Discuss the relationships between soil, water and plant and their significance in planning an irrigation system
- Understand design methods of erodible and non-erodible canals
- Know the principles of design of hydraulic structures on permeable foundations
- Know the concepts for analysis and design principles of storage and diversion head works
- Learn design principles of canal structures

Course Outcomes:

The students will be able to:

CO1	Understand the Planning and design of irrigation systems.
CO2	Understand the design of erodible and non-erodible canals.
CO3	Understand the design principles of canal structures
CO4	Analyze and design of storage and diversion head works
CO5	Understand the detailed concepts of Reservoir Planning, Dams, Gravity dams, Earth Dam and Spillways.

UNIT-I:

IRRIGATION: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, standards of quality for irrigation water, crop rotation.

UNIT– II:

CANALS: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

UNIT-III:

CANAL STRUCTURES:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall.

Regulators: Head and cross regulators, design principles

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

River Training: Objectives and approaches.

UNIT-IV:

DIVERSION HEAD WORKS: Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-V:

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.
Dams: Types of dams, selection of type of dam, selection of site for a dam.
Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis.
Earth Dams: Types, causes of failure, criteria for safe design,
Spillways: Types, design principles of Ogee spillways, Energy dissipation below spillways-stilling basin and its appurtenances.

TEXT BOOKS:

1. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications (P) Ltd.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.

REFERENCES:

1. Irrigation and Water Resources Engineering, Asawa G L (2013), New Age International Publishers
2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard Book House, New Delhi

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IV-Year-I Semester	-	L	T	P	C
		3	0	0	3

GREEN BUILDINGS (OE4101A)

Course Objectives:

1. This course aims to highlight importance of Energy- Efficient Buildings within the context of Energy issues in the 21st century.
2. To familiarize students with the concept of Energy efficiency, Renewable sources of energy and their effective adaptation in green buildings
3. To give a fuller understanding of Building Form and Fabric, Infiltration, ventilation, Lighting, cooling and water conservation.
4. To highlight the importance of Environmental Management as well as Environmental Impact Assessment methods in Energy efficient buildings.

Course Outcomes:

The students will be able to

CO1: Understand why buildings should be made energy efficient.

CO2: Have a fuller grasp on Renewable Energy mechanisms such as Passive Solar heating and collection, Photovoltaics, and Ground source heat pumps, and their adaption to green building concepts.

CO3: Understand the concepts of Site and Climate, Building Form, Building Fabric

CO4: Infiltration and ventilation, Lighting, Heating, Cooling, Energy Management and water conservation.

CO5:Have the necessary skills to undertake an Environmental Impact Assessment study for Energy Efficient Buildings. They shall be equipped with the associated cutting-edge management strategies too.

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT I : Green Buildings within the Indian Context, Types of Energy, Energy Efficiency and Pollution, Better Buildings, Reducing energy consumption, Low energy design.

UNIT II: Renewable Energy sources that can be used in Green Buildings – Conventional and Non Conventional Energy, Solar energy, Passive Solar Heating, Passive Solar collection, Wind and other renewables. A passive solar strategy, Photovoltaics, Rainwater Harvesting Climate and Energy, Macro and Microclimate. Indian Examples.

UNIT III: Building Form – Surface area and Fabric Heat Loss, utilizing natural energy, Internal Planning, rouping of buildings. Building Fabrics- Windows and doors, Floors, Walls, Masonry, Ecological walling systems, Thermal Properties of construction material.

UNIT IV: Infiltration and ventilation, Natural ventilation in commercial buildings, passive cooling, modelling air flow and ventilation, Concepts of daylight factors and day lighting, daylight assessment, artificial lighting, New light sources. Cooling buildings, passive cooling, mechanical cooling. Water conservation- taps, toilets and urinals, novel systems, collection and utilization of rain water.

UNIT V: Energy awareness, monitoring energy consumption, Building Environmental Assessment - environmental criteria - assessment methods - assessment tools (e.g. LEED, GRIHA & IGBC Certification for buildings. Ecohomes, Sustainable architecture and urban design – principles of environmental architecture, Benefits of green buildings – Energy Conservation Building code - NBC -Case Studies – Green Buildings in Auroville and Dakshina Chitra, Tamil Nadu, India

TEXT BOOKS:

1. William T. Meyer., Energy Economics and Building Design., New York: McGraw- Hill, Inc Indian Green Building Council

REFERENCE BOOKS:

1. Public Technology, Inc. (1996). Sustainable Building Technical Manual: Green Building Design, Construction, and Operations. Public Technology, Inc., Washington, DC.
2. Sim Van Der Ryn, Stuart Cowan, "Ecological Design", Island Press (1996).
3. Dianna Lopez Barnett, William D. Browning,"A Primer on Sustainable Building", Rocky Mountain Green Development Services.
4. The HOK Guidebook to Sustainable Design, Sara Mendler and William Odell, John Wiley.
5. David A. Gottfried, Sustainable Building Technical Manual., Public Technology Inc
6. Richard D. Rush, . Building System Integration Handbook., New York: John Wiley & Sons
7. Ben Farmer & Hentie Louw., Companion to Contemporary Architectural Thought, London & New York: Routledge
8. Peter Noever (ed)., Architecture in Transition: Between Deconstruction and New Modernism., Munich: Prestel.

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IV-Year-I Semester		L	T	P	C
		3	0	0	3
ENVIRONMENTAL POLLUTION & CONTROL (OE4101B)					

Course Objectives:

1. To introduce the concepts of Air Pollution.
2. To introduce the concepts of Air Pollution and its control methods.
3. To impart the knowledge of the Solid Waste generation problem.
4. To familiarize the best practices for management of solid wastes adopted at the service provider level.
5. To elucidate noise pollution problems and emphasize the necessity to control them.

Course Outcomes:

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

CO1: Evaluate the ambient air quality based on the analysis of air pollutants and relate the polluting plume behavior with weather data.

CO2: Identify suitable control methods depending on the severity and type of air pollution.

CO3: Classify solid wastes and identify suitable collection and transfer mechanisms.

CO4: Suggest suitable solid waste management methods based on the nature of solid waste and the quantities to be handled.

CO5: Identify the sources of noise pollution and suggest methods for mitigating the problem.

UNIT I

Air Pollution

Definitions, scope, significance and episodes – Types of pollutants, their sources and impacts (on plants, animals, materials) – Classifications, natural & artificial, primary & secondary, point &non point, linear & areal sources, stationary & mobile – Sampling and analysis of air pollutants – Ambient air quality standards by WHO (World Health Organization) & CPCB (Central Pollution Control Board). **(8hrs)**

Air Pollution Meteorology

Properties of atmosphere: heat, pressure, wind forces, moisture and relative humidity – Lapse rates – Influence of terrain and meteorological phenomena on plume behavior and air quality – Wind rose diagrams, plume rise models. **(5hrs)**

UNIT II

Air Pollution Control and Monitoring

Control of particulates: control at sources, process changes, equipment modifications – Design and operation of control equipments, settling chambers, cyclone separators, fabric filters, scrubbers, electrostatic precipitators – Control of gases like SOx , NOx , CO and HC, Air-fuel ratio, computation and control of products of combustion – Monitoring of SPM, SO2 , NOx and CO, Stack Monitoring for flue gases. **(11hrs)**

UNIT III

Solid Waste Generation and Collection

Characteristics – types, sources, and properties of solid waste – Generation, typical generation rates, estimation of solid waste quantities, factors that affect generation of wastes – Collection services, types of collection systems, determination of vehicle and labour requirement and

transportation of solid waste – Transfer stations, transfer means and methods. **(10hrs)**

UNIT IV

Solid Waste Management and Disposal

Engineered systems for solid waste management (refuse, reduce, reuse, recover, recycle) – Reuse of solid waste materials, processing techniques, materials recovery system, recovery of biological, thermal conversion products and recovery of energy from conversion products – Recycling of segregated waste materials – Ultimate Disposal of solid waste (Land filling, incineration, composting). **(10hrs)**

UNIT V

Noise Pollution and Control

Sources of noise pollution, impacts of noise, measurement of noise and permissible limits of noise, control methods of noise pollution, The Noise Pollution (Regulation and Control) Rules, 2000 as per CPCB. **(7hrs)**

TEXT BOOKS:

1. Air Pollution, M.N.Rao, H.V.N.Rao, 1st Edition, McGraw Hill Education.
2. Solid and Hazardous Waste Management, M.N.Rao, Razia Sultana, 1st Edition, BS Publications.
3. Noise Pollution and Its Control,H.C.Bhatia, 1st Edition, Atlantic Publisher

REFERENCES:

1. Advanced Air and Noise Pollution Control, Lawrence K.Wang, Norman C. Pereira, Yung-Tss Hung, 2005 Edition, Humana Press.
2. Municipal Solid Waste Management, P.Jayarama Reddy, 1st Edition, B.S.Publications.

E- RESOURCES:

1. Environmental Pollution and Control, 4th ed. by J. Jeffrey Peirce, P. Aarne Vesilind, Ruth F. Weiner
   https://www.bbau.ac.in/dept/UIET/TCE-033%20%20epdf.pub_environmental-pollution-and-control.pdf
2. ENVIRONMENTAL POLLUTION - CONTROL MEASURES
   https://www.bbau.ac.in/dept/UIET/Study%20Materials%20for%20TCE-0.pdf

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IV-Year-I Semester		L	T	P	C
		3	0	0	3
SAFETY ENGIEERING (OE4102C)					

Course Objectives:

The objective of this course is to enable the students to:

1. To import concepts of safety w.r.t construction Industry
2. To understand various hazards in construction industry and preventive measures
3. To learn safety operation of construction machinery
4. To learn techniques to distinguish civil structures safety
5. To understand fire safety principles

Course Outcomes:

The students will be able to

CO1: Develop management plans to prevent accidents in construction industry.

CO2: Prepare plans to safe guard workers in construction of high risk buildings.

CO3: Ensure safety while operating construction machinery.

CO4: Outline safety plans for demolition of buildings.

CO5: Prepare fire safety plans for a given building.

BL – Bloom's Taxonomy Levels

1- Remembering, 2- Understanding, 3 – Applying, 4 – Analysing, 5 – Evaluating, 6 - Creating

UNIT-I

Accidents Causes And Management Systems: Problems impeding safety in construction industry-causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident – construction regulations, contractual clauses – Pre contract activities, preconstruction meeting - design aids for safe construction – permits to work quality assurance in construction - compensation – Recording of accidents and safety measures – Education and training.

UNIT-II

Hazards Of Construction And Prevention: Excavations, basement and wide excavation, trenches, shafts – scaffolding, types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work, dismantling –tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water – road works – power plant constructions – construction of high rise buildings.

UNIT-III

Working At Heights: Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings, requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection, safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.

UNIT-IV

Construction Machinery: Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder's hoist, winches, chain pulley blocks – use of conveyors – concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, hoisting cranes – use of conveyors and mobile cranes – manual handling.

UNIT-V

Safety In Demolition Work: Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods – interesting experiences at the construction site against the fire accidents.

TEXT BOOKS:

1. 'Safety in the Build Environment' by Jnathea D.Sime, London, 1988.
2. 'Reliability Maintenance and Safety Engineering, by Gupta A K, Laxmi Publications, New Delhi.
3. 'Safety Management' by John V. Grimoldi, AITBS Publishers and Distributors, New Delhi.

REFERENCES:

1. 'Construction hazard and Safety Hand book' by Hudson, R., Butter Worth's, 1985.
2. 'Construction Safety Hand Book' by V. J. Davies and K. Thomasin, Thomas Telford Ltd., London, 1990.
3. 'Handbook of OSHA Construction Safety and Health' by Charles D. Reese & James V. Edison.

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IV-Year-I Semester		L	T	P	C
		1	0	2	2
ETABS (SAC4101A)					

Course objectives:

The main objectives are

1. Learn the usage of software from a carrier point of view.
2. Creating geometry using gird systems.
3. Analyze and Interpret the results using post-processor.
4. Design and Detail the Structural Elements.

Course Outcomes:

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

CO1: To understand the importance of Structural Analysis and Design aspects as per IS Codes using ETABS.

CO2: To analyze and design the Beams.

CO3: To analyze and design the Structures subjected to Gravity and Lateral Loads as per IS Codes.

CO4: To acquire knowledge of detailing using ETABS software.

List of Experiments:

1. Introduction to Structural Analysis.
2. Introduction to Structural Design as per IS codes.
3. Introduction to ETABS Software.
4. Analysis and Design of simple 2D RCC Beams.
5. Analysis and Design of continuous 2D RCC Beams.
6. Gravity Analysis and Design of 2D RCC frames.
7. Gravity Analysis and Design of 3D Ground Floor RCC Structure.
8. Introduction to Wind and Seismic Analysis as per IS codes.
9. Wind Analysis of Multi-Storey Buildings.
10. Seismic Analysis of Multi-Storey Buildings.
11. Gravity Analysis and Design of Multi-Storey Building.
12. Analysis and Design of Multi-Storey RCC Buildings subjected to lateral Loads.
13. Analysis and Design of Steel Structure.
14. Design and Detailing of G+2 Building.
15. Design and Detailing of Multi-Storey Building subjected to lateral loads.

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IV-Year-I Semester		L	T	P	C
		1	0	2	2
BENTLEY PRO-STRUCTURES (SAC4101B)					

Course Objectives:

1. **Learn** the usage of software for analysis & design
2. **Create** geometries using pre-processor
3. **Analyze** and interpret the results using post processor
4. **Design & Detailing** of structural elements using IS Codes

Course Outcomes:

At the end of the course the students can able

CO1: To analyze & design the determinate & indeterminate Beams

CO2: To analyze & design the determinate & indeterminate Frames and Truss

CO3: To analyze & design the RCC & Steel structures for various loads

CO4: To learn the designing & detailing concepts of structural elements

LIST OF EXPERIMENTS

1. Recollecting the concepts of Structural Analysis & Design
2. Introduction to the Software
3. Analysis & Design of simple beams
4. Analysis & Design of continuous beams
5. Analysis & Design of simple 2D frames
6. Analysis & Design of simple 2D truss
7. Analysis & Design of simple 3D frames
8. Gravity Analysis & Design of multi-storey building (by referring IS Codes)
9. Analysis of multi-storey building subjected to lateral loads (WL & EL)
10. Analysis & Design of Electrical Towers subjected to wind loads
11. Design & Detailing of determinate R.C frames
12. Design & Detailing of indeterminate R.C frames
13. Design & Detailing of determinate Steel frames
14. Design & Detailing of indeterminate Steel frames

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IV-Year-I Semester		L	T	P	C
		1	0	2	2
IIT PAVE (SAC4101C)					

Course Objectives:

The Main Objective is:

To develop skills to use IIT Pave software to design and modeling of Road networks and an insight to ground improvement techniques.

Course Outcomes:

CO1: The course covers relevant topics from Transportation Engineering and gives you an insight on various topics in detail.

CO2: In this course, the student will be able to understand the various topics and terminologies used in Ground Improvement Techniques.

CO3: The course covers the basic terminologies, application, and testing procedures of Geo-synthetics on various topics in detail.

List of Experiments:

1. Analyze and design reinforced pavements.
2. Analysis of allowable stresses and strains.
3. Design of flexible pavement as per IRC method
4. Applications of Geo-synthetics.
5. Core concept of unreinforced pavements

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IV-Year-I Semester		L	T	P	C
		1	0	2	2
TEKLA (SAC4101D)					

Course Objectives:

The Main Objective is:

To develop skills to use Tekla software to design and modeling of Railway bridge and built-up compression members.

Course Outcomes:

The students will be able to

CO1: Model Built-up compression members, railway bridge, G+1 Braced and unbraced buildings.

C02: Design connections and built-up compression members.

List of Experiments:

1. Design of Connections.
2. Modeling and design of Built-up compression members.
3. G+1 braced Buildings
4. G+1 unbraced Buildings
5. Modeling of Railway bridge

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IV-Year-I Semester		L	T	P	C
		0	0	6	3
INDUSTRIAL / RESEARCH INTERNSHIP					

IV-Year-II Semester		L	T	P	C
		0	0	0	8

MAJOR PROJECT

PROJECT WORK, SEMINAR, AND INTERNSHIP IN INDUSTRY (PROJ4201)

IV-Year-II Semester		L	T	P	C
		0	0	0	4

COMMUNITY SERVICE PROJECT

(PROJ4202)