ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABI

OF

CIVIL ENGINEERING

FOR

B.TECH REGULAR FOUR YEAR DEGREE PROGRAM

(For the batches admitted from 2020-2021)

&

FOR B.TECH LATERAL ENTRY PROGRAM

(For the batches admitted from 2021-2022)

CHOICE BASED CREDIT SYSTEM

SREE VIDYANIKETHAN ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUA, Ananthapuramu, Approved by AICTE, Programs Accredited by NBA, Accredited by NAAC with 'A' grade)
SREE SAINATH NAGAR, A. Rangampet -517102:: NEAR TIRUPATI (A.P)

VISION

To be one of the Nation's premier Engineering Colleges by achieving the highest order of excellence in Teaching and Research.

MISSION

- To foster intellectual curiosity, pursuit and dissemination of knowledge.
- To explore students' potential through academic freedom and integrity.
- To promote technical mastery and nurture skilled professionals to face competition in ever increasing complex world.

QUALITY POLICY

SreeVidyanikethanEngineeringCollege strives to establish a system of Quality Assurance to continuously address, monitor and evaluate the quality of education offered to students, thus promoting effective teaching processes for the benefit of students and making the College a Centre of Excellence for Engineering and Technological studies.

DEPARTMENT OF CIVIL ENGINEERING

VISION

To become a leading centre of excellence in the country in Civil Engineering education through teaching, research, consultancy and public service for technical development in a knowledge society.

MISSION

- Inspire the civil engineers of tomorrow to take on the challenges of creating and sustaining the built environment that support our society.
- Nurture these civil engineers with fundamental engineering knowledge, a broad set of skills, and an inquisitive attitude for creating innovative solutions to serve industry and community through contemporary curriculum, congenial learning environment, pertinent research, industry-institute interaction, mentoring, co-curricular and extra-curricular activities.
- Encourage faculty and staff to excel in their respective fields and demonstrate the best of their abilities by way of continuing education, research and consultancy.

PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of B.Tech. (CE) will:

1. Pursue higher education in civil engineering or other fields of engineering or management or other areas of interest.
2. Address the contemporary issues in Civil Engineering or related field and provide appropriate solutions through professional career in industry/teaching/research.
3. Engage in 'technology innovation and deployment' and engineering system implementation, as an entrepreneur.
4. Exhibit leadership qualities, participate in continuing education programmes for lifelong learning and contribute individually and as a member in multidisciplinary teams to meet social and ethical constraints.

PROGRAM OUTCOMES

On successful completion of the Program, the graduates of B.Tech. (CE) program will be able to:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. **(Engineering knowledge**)
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. **(Problem analysis)**
3. 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. **(Design/development of solutions)**
4. 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. **(Conduct investigations of complex problems**)

5. 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. **(Modern tool usage**)

6. 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. (**The engineer and society**)

7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development). **(Environment and sustainability)**

8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. (**Ethics**)

9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. **(Individual and team work**)

10. 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. **(Communication**)

11. 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. **(Project management and finance**)

12. 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. **(Life-long learning**)

PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of B.Tech. (CE) program will be able to:

PSO1: Plan, draw, analyze, design, construct, valuate, manage, maintain, retrofit and rehabilitate civil engineering systems and processes by applying suitable materials, tools and techniques.

PSO2: Identify minerals, rocks, structural geology problems and understand geological maps; characterize soil; choose foundations; select ground improvement techniques; and plan and design transport systems.

PSO3: Perform land survey; plan, design, construct, maintain and manage water resources systems; analyze water and wastewater; manage solid waste; plan, design and execute environmental systems and processes.

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)
(Affiliated to J.N.T. University Anantapur, Ananthapuramu)

ACADEMIC REGULATIONS (SVEC-20)
CHOICE BASED CREDIT SYSTEM

B.Tech. Regular Four Year Degree Program
(For the batches admitted from the academic year 2020–21)

and

B.Tech. (Lateral Entry Scheme)
(For the batches admitted from the academic year 2021-22)

For pursuing four year undergraduate Degree Program B.Tech offered by Sree Vidyanikethan Engineering College under Autonomous status and herein after referred to as SVEC:

1. Applicability:

All the rules specified herein, approved by the Academic Council, shall be in force and applicable to students admitted from the academic year 2020-2021 onwards. Any reference to "College" in these rules and regulations stands for SVEC.

2. Extent:

All the rules and regulations, specified hereinafter shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. It shall be ratified by the Academic Council in the forthcoming meeting. As per the requirements of statutory bodies, Principal, Sree Vidyanikethan Engineering College shall be the Chairman, Academic Council.

3. Admission:

3.1. Admission into First Year of Four Year B.Tech. Degree Program in Engineering:

3.1.1. Eligibility: A candidate seeking admission into the First Year of four year B.Tech. Degree Program should have:

Passed either Intermediate Public Examination (I.P.E.) conducted by the Board of Intermediate Education, Andhra Pradesh, with Mathematics, Physics and Chemistry as optional courses (or any equivalent examination recognized by JNTUA, Ananthapuramu) for admission as per the guidelines of Andhra Pradesh State Council of Higher Education (APSCHE).

3.1.2. Admission Procedure: Admissions shall be made into the first year of four year B.Tech. Degree Program as per the stipulations of APSCHE, Government of Andhra Pradesh:

(a) By the Convener, EAMCET, (for Category-A Seats).
(b) By the Management (for Category-B Seats).
(c) By the Management (for 15% Supernumerary Quota) for Persons of Indian Origin (PIO)/Foreign Nationals (FN)/ Children of Indian Workers in Gulf Countries/ Overseas Citizen of India (OCI)

3.2. Admission into the Second Year of Four year B.Tech Degree Program in Engineering (Lateral Entry).

3.2.1. Eligibility: A candidate seeking admission into the Second Year of four year B.Tech. Degree Program (Lateral Entry) should have:

(i) Passed Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or equivalent Diploma recognized by JNTUA, Ananthapuramu).
(ii) Candidates qualified in ECET and admitted by the Convener, ECET. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained.

3.2.2. Admission Procedure: 10% of the sanctioned strength in each Program of study as lateral entry students or as stipulated by APSCHE shall be filled in by the Convener, ECET.

4. Programs of study offered leading to the award of B.Tech. Degree:

Following are the four year undergraduate Degree Programs of study offered in various branches in SVEC leading to the award of B.Tech (Bachelor of Technology) Degree:

1) Civil Engineering
2) Electrical and Electronics Engineering
3) Mechanical Engineering
4) Electronics and Communication Engineering
5) Computer Science and Engineering
6) Electronics and Instrumentation Engineering
7) Information Technology
8) Computer Science and Systems Engineering
9) Computer Science and Business Systems
10) Computer Science and Engineering (Artificial Intelligence)

11)Computer Science and Engineering (Data Science)

12)Computer Science and Engineering (Artificial Intelligence & Machine Learning)

13)Computer Science and Engineering (Internet of Things)

14)Computer Science and Engineering (Cyber Security)

15) Computer Science and Design

5. Duration of the Program:

5.1.Minimum Duration: The program shall extend over a period of four years leading to the Degree of Bachelor of Technology (B.Tech) of the JNTUA, Ananthapuramu. The four academic years shall be divided into eight semesters with two semesters per year. Each semester shall normally consist of 22 weeks having - Continuous Internal Evaluation (CIE) and Semester End Examination (SEE), Choice Based Credit System (CBCS) and Credit Based Semester System(CBSS) as suggested by UGC and Curriculum/ Course Structure as suggested by AICTE/APSCHE are followed. Provision is made for lateral entry admission of students into the Second Year of the program in all the branches of study and they shall be required to satisfy the conditions of admissions thereto prescribed by the JNTUA, Ananthapuramu and Government of Andhra Pradesh.

5.2. Maximum Duration:

The student shall complete all the passing requirements of the B.Tech degree program within a maximum duration of 8 years (6 years for lateral entry), these durations reckoned from the commencement of the semester to which the student was first admitted to the program.

6. Structure of the Program:

Each Program of study shall consist of:

(i) HS (Humanities and Social Sciences) Courses

(ii) BS (Basic Sciences) Courses

(iii) ES (Engineering Sciences) Courses

(iv) PC (Professional Core) Courses

(v) PE (Professional Electives)

(vi) OE (Open Electives) Courses

(vii) SO (Skill Oriented) Courses

(viii) Mandatory Courses (MC)

(ix) Audit Courses (AC)

(x) Projects (PR) (Internships, Project Work)

S.No	Course Category	Course Type
1.	HS – Humanities and Social Sciences	Humanities, Social Sciences and Management.
2.	BS – Basic Sciences	Mathematics, Physics and Chemistry Courses, etc.
3.	ES – Engineering Sciences	Fundamental Engineering courses.
4.	PC – Professional Core	Core courses related to the Parent Discipline/ Branch of Engineering.
5.	PE – Professional Electives	Elective courses related to the Parent Discipline/ Branch of Engineering.
6.	OE – Open Electives	Electives from other technical and /or emerging courses
7.	SO (Skill Oriented) Courses	Basic and advanced skills related to the domain courses, soft skills course
8.	PR - Projects	Summer Internships, Internship, Project Work
9.	MC - Mandatory Courses	Induction Program, Environmental Science, Universal Human Values
10.	AC - Audit Courses	Value Added Courses.

Contact Periods:

The contact periods per week are assigned depending on the complexity and volume of the course.

7. Credit Courses:

All Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Course in a L: T: P: C (Lecture Hours: Tutorial Hours: Practical Hours: Credits) Structure, based on the following general pattern.

- **Theory Courses:** One Lecture Hour (L) per week in a semester: 01 Credit
- **Practical Courses:** One Practical Hour (P) Per week in a semester: 0.5Credit
- **Tutorial:** One Tutorial Hour (T) Per week in a semester: 01 Credit
- **Mandatory Courses:** No **CREDIT** is awarded.
- **Audit Courses:** No **CREDIT** is awarded.

Student activities like Sports, Study Tour and Guest Lecture etc. shall not carry ANY Credits.

For Summer Internships, Internship and Project Work, where formal contact periods are not specified, credits are assigned based on the complexity of the work to be carried out.

The four year curriculum of any B. Tech Program of study shall have a total of **160** credits. However the curriculum for students admitted under lateral entry shall have a total of **121** credits.

8. Choice Based Credit System (CBCS):

Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

- Student centred learning
- Students to learn courses of their choice
- Interdisciplinary learning

A Student has a choice of registering for courses comprising program core, professional electives, open electives, value added, Skill oriented courses etc. Besides, choice is also offered to students for registering courses to earn Minor in Engineering/Honors degree.

9. Course Enrollment and Registration

9.1. Each student, on admission shall be assigned to a Faculty Advisor (Mentor) who shall advice and counsel the student about the details of the academic program and the choice of courses considering the student's academic background and career objectives.

9.2. Each student on admission shall register for all the courses prescribed in the curriculum in the student's first and second Semesters of study. The student shall enroll for the courses with the help of the student's Faculty Advisor (Mentor). The enrollment for the courses from II B.Tech I Semester to IV B.Tech I Semester shall commence 10 days prior to the last instructional day of the preceding semester for registration process. If the student wishes, the student may drop or add courses (vide clause 8) 10 days prior to commencement of the concerned semester and complete the registration process duly authorized by the Chairman, Board of Studies of concerned department.

9.3. If any student fails to register the courses in a semester, he shall undergo the courses as per the program structure.

9.4. After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the Semester-end Examinations.

9.5. Elective courses shall be offered by a Department only if a minimum of 40 students register for that course.

10. Break of Study from a Program (Gap Year)

10.1. A student is permitted to go on break of study for a maximum period of two years either as two breaks of one year each or a single break of two years.

10.2. In case, a student wishes to extend the gap year for one more consecutive year, he shall be permitted with the prior approval of the Principal on the recommendations of the Head of the Department prior to the beginning of the semester in which he has taken break of study.

10.3. The student shall apply for break of study in advance, in any case, not later than the last date of the first assessment period in a semester. The gap year concept is introduced for start-up (or) incubation of an idea, National/International Internships, and professional Volunteering. The application downloaded from the website and duly filled in by the student shall be submitted to the Principal through the Head of the department. A committee shall be appointed by the Principal in this regard. Based on the recommendations of the committee, Principal shall decide whether to permit the student to avail the gap year or not.

10.4. The students permitted to rejoin the program after break of study shall be governed by the Curriculum and Regulations in force at the time of rejoining.

The students rejoining in new regulations shall apply to the Principal in the prescribed format through Head of the Department, at the beginning of the readmitted semester for registering additional/equivalent courses to comply with the curriculum in-force.

10.5. The two years period of break of study shall not be counted for the maximum Period of graduation (i.e the maximum period of graduation is 10 years for Regular admitted students and 8 years for Lateral Entry admitted students availing Gap Year).

10.6. If a student has not reported to the college after completion of the approved period of break of study he is deemed to be detained in that semester. Such students are eligible for readmission into the semester when offered next.

11. Examination System:

11.1 All components in any Program of study shall be evaluated through internal evaluation and/or an external evaluation conducted as Semester-end examination.

<table>
<tr><th>Sl. No.</th><th>Course</th><th>Marks</th><th colspan="2">Examination and Evaluation</th><th>Scheme of examination</th></tr>
<tr><td rowspan="3">1.</td><td rowspan="3">Theory</td><td>70</td><td colspan="2">Semester-end examination for 3 hours duration (External evaluation)</td><td>The examination question paper in theory courses shall be for a maximum of 70 marks.
The question paper shall be of descriptive type with FIVEEITHER/OR type questions, ONE EITHER/OR type question from each unit [totally ten questions from Q. No. 1 to 10)] of which student has to answer one from each EITHER/OR type question and shall be evaluated each for 14 marks.</td></tr>
<tr><td rowspan="2">30</td><td>10</td><td>Assignments (Internal evaluation)</td><td>One Assignment shall be given to the student for 10 marks during the semester.</td></tr>
<tr><td>20</td><td>Mid-term Examination of 2 hours duration (Internal evaluation)</td><td>Two mid-term examinations each for 20 marks shall be conducted. For a total of20 marks, 80% of better one of the two and 20% of the other one are added and finalized, any fraction shall be rounded off to the higher integer number.
The examination shall be conducted and evaluated for 40 marks and scaled down to 20 marks, any fraction shall be rounded off to the higher integer number.
Mid-I: After first spell of instruction (I & II Units).
Mid-II: After second spell of instruction (III, IV & V Units).
The question paper shall of descriptive type with two parts i.e., Part-A and Part-B. Part-A shall contain 5 short answer questions [Q. No. 1 (a) to (e)] and evaluated each for 2 marks. Part-B shall contain three EITHER/OR type questions [totally six questions from Q. No. 2 to 7)] of which student has to answer one from each EITHER/OR type question and shall be evaluated each for 10 marks. Further, in the case of Part-B of Mid-I, one EITHER/OR type question from each unit and third either or type question from both the units; and for Mid-II, one EITHER/OR type question from each unit.</td></tr>
<tr><td rowspan="3">2.</td><td rowspan="3">Laboratory</td><td>70</td><td colspan="2">Semester-end Lab Examination for 3 hours duration (External evaluation)</td><td>The examination shall be conducted by the faculty member handling the laboratory (Examiner-2) and another faculty member (Examiner-1) appointed by the Chief Controller of Examinations.</td></tr>
<tr><td rowspan="2">30</td><td>20</td><td>Day-to-Day evaluation for Performance in laboratory experiments and Record. (Internal evaluation)</td><td rowspan="2">Two laboratory examinations each for 30 marks which include Day-to-Day evaluation and Practical examination shall be evaluated by the faculty member. For a total of 30 marks 80% of better one of the two and 20% of the other one are added and finalized, any fraction shall be rounded off to the higher integer number.
Mid-I: Shall be conducted just before FIRST mid-term theory examinations.
Mid-II: Shall be conducted just before SECOND mid-term theory examinations.</td></tr>
<tr><td>10</td><td>Practical Examination (Internal evaluation)</td></tr>
</table>

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
3.	Mandatory courses	30	Internal Evaluation		Shall be evaluated as given in 11.2.1
4.	Audit Courses	-	-		As detailed in 11.2.2
5.	MOOC	100	-		Thestudent has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score the equivalent Grade Point and Credits will be assigned as given in 11.3.
6.	Summer Internship	100	Semester-end evaluation		The evaluation shall be done by the Internship Evaluation Committee (IEC) at the end of the semester as given in 11.4.
7.	Internship	-	-		At the end of semester the student should submit an internship completion certificate as given in 11.5
8.	Project Work	200	100	Internal evaluation	Continuous evaluation shall be done by the Project Evaluation Committee (PEC) as given in 11.6.1
			100	Semester-end evaluation	Project Work Viva-Voce Examination shall be conducted by a Committee at the end of the semester as given in 11.6.2

11.2 Mandatory Course/ Audit Course Evaluation:

11.2.1.Mandatory Courses:

Mandatory courses carry **"ZERO"** credits. There shall be **NO Semester-end** examination. However, ATTENDANCE in Mandatory courses shall be considered while calculating aggregate attendance in a semester. The mid-term examination shall be conducted and evaluated similar to the THEORY courses. The student shall be declared to have passed the mandatory courses only when HE secures **40% marks in the internal evaluation.** If the student FAILS, a re-examination shall be conducted for FAILED candidates in the CONSECUTIVE semester. The performance of the student shall be indicated in the grade sheets "**SATISFACTORY" (or) "NOT SATISFACTORY"** as given in 14.1**.** The student should pass all the mandatory courses, for the award of B.Tech degree.

11.2.2. Audit Courses:

Audit courses carry "**ZERO**" credits. There shall be **NO mid-term** and **Semester-end examination**. However, ATTENDANCE in Audit courses shall be considered while calculating aggregate attendance in a semester. The student should study all the audit courses, and it shall be indicated in the GRADE Sheet.

11.3 Massive Open Online Course (MOOC)

MOOC is a web-based learningaimed at unlimited participation and open access.

11.3.1 A Student shall be permitted to pursue **two elective courses** under MOOC during the program of study. The duration of the MOOC shall be for a minimum period of 08 weeks.

11.3.2 The student shall confirm registration by enrolling the course within 10 days prior to the last instructional day of the current Semester of study along with regular courses.

11.3.3 The list of courses along with MOOC service providers shall be identified, approved and notified by the Chairman, BOS and Head of the Department.

11.3.4 The student has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score earned, the equivalent Grade Point and Credits will be assigned.

11.3.5 Attendance is not applicable for MOOC Course and also attendance will not be monitored.

11.3.6 If the student fails to submit the MOOC certificate at the end of the semester, his performance in MOOC will be shown as "Fail" in the Grade sheet. Then the student shall register for the supplementary examinations and submit the MOOC certificate.

11.4. Summer Internship

11.4.1 Students shall undergo mandatory two summer internships each with a minimum of Four weeks duration, at the end of second and third year of the Programme. The internship can be done by the students at Govt. Organizations, construction agencies, Industries, Research Centres, MNC, Academic Institutes, etc.

11.4.2 The progress of the Internship is monitored by the supervisor periodically. Evaluation of the summer internships shall be conducted by the Internship Evaluation Committee (IEC) at the end of semester. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the IEC. The report and the oral presentation shall carry 40% and 60% weightage respectively.

11.4.3 If any student fails to complete summer internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the summer internship.

11.5. Internship

11.5.1 In the final semester of program of study, the student should mandatorily undergo internship for the entire semester andparallelly work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate. A student shall also be permitted to submit project report on the work carried out during the internship.

11.5.2 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.

11.6 Project Work:

11.6.1 **Internal Evaluation**: The Internal Evaluation shall be made by the Project Evaluation Committee (PEC) consisting of concerned supervisor and two senior faculty members, on the basis of TWO project reviews on the topic of the project. Each review shall be conducted for a maximum of "100" marks. For a total of 100 marks, 80% of better one of the two and 20% of the other one are added and finalized. The PEC is constituted by the Principal on the recommendations of the Head of the Department.

11.6.2 **Semester-end Evaluation**: The Semester-end Project Work Viva-Voce Examination shall be conducted by a Committee consisting of External examiner (nominated by the Chief Controller of Examinations), HOD and concerned Supervisor. The evaluation of project work shall be done at the end of the IV B.Tech II Semester.

Three copies of the dissertation certified in the prescribed format by the concerned Supervisor and HOD shall be submitted to the Department. One copy is to be submitted to the Chief Controller of Examinations. The examiner shall be nominated by the Chief Controller of the Examinations from the panel of SIX examiners submitted by the Department.

11.7. Eligibility to appear for the Semester-End Examination (SEE):

11.7.1. A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the courses in a semester.

11.7.2. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

11.7.3. Shortage of Attendance below 65% in aggregate **shall in no case be condoned.**

11.7.4. Students whose shortage of attendance is not condoned in any semester are not eligible to take their semester-end examinations of that class and their registration shall stand cancelled.

11.7.5. A student shall not be promoted to the next semester unless he satisfies the attendance requirements of the current semester, as applicable. The student may seek readmission for the semester when offered next. He shall not be allowed to register for the courses of the semester while he is in detention. A student detained due to shortage of attendance, shall have to repeat that semester when offered next.

11.7.6.A stipulated fee shall be payable to the College towards Condonation of shortage of attendance.

11.7.7. For the calculation of a student attendance in any semester, the total number of classes conducted shall be counted as scheduled in the class-work time table.

11.8. Evaluation:

Following procedure governs the evaluation.

11.8.1. Marks for components evaluated internally by the faculty shall be submitted to the Controller of Examinations one week before the commencement of the Semester-end examinations. The marks for the internal evaluation components shall be added to the external evaluation marks secured in the Semester-end examinations, to arrive at the total marks for any course in that semester.

11.8.2. Performance in all the courses is tabulated course-wise and shall be scrutinized by the Results Committee and moderation is applied if needed and course-wise marks are finalized. Total marks obtained in each course are converted into letter grades.

11.8.3. Student-wise tabulation shall be done and individual grade Sheet shall be generated and issued to the student.

11.9. Recounting /Revaluation/Personal Verification/ Challenging Evaluation:

Students shall be permitted to apply for **Recounting /Revaluation/Personal Verification/ Challenging Evaluation** of the Semester-end examination answer scripts within a stipulated period after payment of the prescribed fee. After completion of the process of **Recounting /Revaluation/Personal**

Verification/ Challenging Evaluation, the records are updated with changes if any, and the student shall be issued a revised grade sheet. If there are no changes, the student shall be intimated the same through a notice.

11.10. Supplementary Examination:

In addition to the regular semester-end examinations conducted, the College may also schedule and conduct supplementary examinations for all the courses of other semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

12. Academic Requirements for promotion/completion of regular B.Tech Program of study:

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion/completion of regular B.Tech Program of study.

For students admitted into B.Tech. (Regular) Program:

12.1. A student shall be deemed to have satisfied the minimum academic requirements for each theory course, laboratory course, Internship and project work, if he secures not less than 35% of marks in the Semester-end examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-end examination taken together.

12.2. A student shall be promoted from second year to third year of Program of study only if he fulfills the academic requirement of securing 40% credits (rounded off to lower integer number) from the following examinations (Irrespective of whether or no the candidate appears for the semester-end examinations as per the normal course of study):

a. **One** regular and **two** supplementary examinations of I B.Tech I Semester.

b. **One** regular and **one** supplementary examinations of I B.Tech II Semester.

c. **One** regular examination of II B.Tech I Semester.

12.3. A student shall be promoted from third year to fourth year of Program of study only if he fulfills the academic requirements of securing 40% credits (rounded off to lower integer number)from the following examinations (Irrespective of whether or not the candidate appears for the semester-end examinations as per the normal course of study):

a. **One** regular and **four** supplementary examinations of I B.Tech I Semester.

b. **One** regular and **three** supplementary examinations of I B.Tech II Semester.

c. **One** regular and **two** supplementary examinations of II B.Tech I Semester.

d. **One** regular and **one** supplementary examinations of II B.Tech II Semester.

e. **One** regular examination of III B.Tech I Semester.

* In case of getting detained for want of credits by sections 12.2 and 12.3 above, the student may make up the credits through supplementary examinations.

12.4. A student shall register for all the 160 credits and earn all the 160 credits. Marks obtained in all the 160 credits shall be considered for the calculation of the CLASS based on CGPA.

12.5. A student who fails to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit his seat in B.Tech. Program and his admission stands cancelled.

For Lateral Entry Students (batches admitted from the academic year 2021-2022):

12.6. A student shall be deemed to have satisfied the minimum academic requirements for each theory course, laboratory course, Internship and project work, if he secures not less than 35% of marks in the Semester-end examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-end examination taken together.

12.7. A student shall be promoted from third year to fourth year of Program of study only if he fulfills the academic requirements of securing 40% credits (rounded off to lower integer number) from the following examinations (Irrespective of whether or not the candidate appears for the semester-end examinations as per the normal course of study):

a. **One** regular and **Two** supplementary examinations of II B.Tech I Semester.

b. **One** regular and **One** supplementary examinations of II B.Tech II Semester.

c. **One** regular examination of III B.Tech I Semester.

Irrespective of whether or not the candidate appears for the semester-end examination as per the normal course of study and in case of getting detained for want of credits the student may make up the credits through supplementary examinations.

12.8. A student shall register for all 121 credits and earn all the 121 credits. Marks obtained in all the 121 credits shall be considered for the calculation of the CLASS based on CGPA.

12.9. A student who fails to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit his seat in B.Tech Program and his admission stands cancelled.

13. NCC/NSS Activities:

All students should register for NCC/NSS activities. A student will berequired to participate in an activity for two hours in a week for one semester. Student shall register during Fourth or Fifth semester of the program of study. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheeton the basis of participation, attendance, performance and behavior. If a student gets anunsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, inorder to complete the degree requirements.

14. Minor Degree in a discipline:

The concept of Minor degree is introduced in the curriculum of all B. Tech. programs offering a Major degree. The main objective of Minor degree in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B.Tech. Program. In order to earn a Minor degree in a discipline, a student has to earn **20** extra credits(By studying Six Theory Courses) from the core courses of the minor discipline.

a. Students having a CGPA of 8.0 or above up to II B.Tech I-Semester without any backlogs shall be permitted to register for Minor degree by paying the requisite fee.

b. An SGPA and CGPA of 7.5 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor Degree registration live or else it shall be cancelled.

c. Students aspiring for a Minor degree must register from III B.Tech I-Semester onwards and must opt for a **Minor in a discipline other than the discipline** he is registered in.

d. A Student shall register for a Minor with **Eight** credits in III B.Tech I-Semester (**TWO** theory courses), **Six** credits in III B.Tech II-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC) and **Six** credits in IV B.Tech I-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC).

e. The evaluation pattern of the courses offered (for 16 credits) shall be similar to the regular program courses evaluation. However, the remaining 4 credits must be acquired through two MOOCs, which shall be domain specific each with 2 credits and with minimum duration of 08 weeks each.

f. The list of courses along with MOOC service providers shall be identified, approved and notified by the Chairman, BOS and Head of the Department.

g. The student has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score earned, the equivalent Grade Point and Credits will be assigned. Attendance is not applicable for MOOC Course and also attendance will not be monitored.

h. Minimum strength required for offering a Minor in a discipline is 40 students.

i. A student registered for Minor degree shall pass in all subjects that constitute the requirement for the Minor degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Minor degree program.

j. The Minor degree shall be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in Computer Science & Engineering with Minor in Title of the Minor Pursued This shall also be reflected in the transcripts, along with the list of courses taken for Minor degree program with CGPA mentioned separately.

k. Separate course/class work and time table shall be arranged for the various Minor degree programs. Attendance regulations for these Minor discipline programs shall be as per regular courses.

NOTE: Interested meritorious students shall be permitted to register either for Minor degree in a discipline (or) Honors Degree in a discipline only, **but not both.**

15. Honors Degree in a discipline:

The concept of Honors degree is introduced in the curriculum for all B. Tech. programs. The main objective of Honors degree is to provide additional learning opportunities for academically motivated students in the same or allied discipline and it is an optional feature of the B. Tech. program. In order to earn Honors degree in a discipline, a student has to earn **20** extra credits (By studying SIX Theory Courses).

a. Students having a CGPA of 8.0 and above up to II B.Tech I-Semester without any backlogs shall be permitted to register for Degree with Honors by paying the requisite fee.

b. An SGPA and CGPA of 7.5 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Honors Degree registration live or else it shall be cancelled.

c. Students aspiring for a Honors degree must register from III B.Tech I-Semester onwards.

d. A Student shall register for a Honors with **Eight** credits in III B.Tech I-Semester

(**TWO** theory courses), **Six** credits in III B.Tech II-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC) and **Six** credits in IV B.Tech I-Semester (**TWO** theory courses- one from the pool of courses offered and other one through MOOC).

e. The evaluation pattern of the courses offered (16 credits) shall be similar to the regular program courses evaluation. However, the remaining 4 credits must be acquired through two MOOCs, which shall be domain specific each with 2 credits and with minimum duration of 8 weeks.

f. The list of courses along with MOOC service providers shall be identified, approved and notified by the Chairman, BOS, and Head of the Department.

g. The student has to submit MOOC certificate with percentage of Score earned to the Head of the Department at the end of the semester. Based on the score earned, the equivalent Grade Point and Credits will be assigned.

h. Attendance is not applicable for MOOC Course and also attendance will not be monitored

i. Minimum strength required for offering a**Honors in a** discipline is 10% of the sanctioned intake.

j. A student registered for Honors degree shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree program.

k. The Honors degree shall be mentioned in the degree certificate as Bachelor of Technology (Honors) in XXX. Example, Bachelor of Technology (Honors) in Computer Science & Engineering. This shall also be reflected in the transcripts, along with the list of courses taken for Honors degree program with CGPA mentioned separately.

l. Separate course/class work and time table shall be arranged for the various Honors degree programs. Attendance regulations for these Honors discipline programs shall be as per regular courses.

NOTE: Interested meritorious students shall be permitted to register either for Minor degree in a discipline (or) Honors Degree in a discipline only, **but not both.**

16. Transitory Regulations:

Students who got detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the Program in earlier regulations (or) who have discontinued and wish to continue the Program are eligible for admission into the unfinished semester from the date of

commencement of class work with the same (or) equivalent courses as and when courses are offered and they shall be in the academic regulations into which they are presently readmitted.

A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of eight years and a lateral entry student within six years for the award of B.Tech Degree.

17. Grades, Semester Grade Point Average and Cumulative Grade Point Average:

17.1. Grade System: After all the components and sub-components of any course (including laboratory courses) are evaluated, the final total marks obtained shall be converted into letter grades on a "10 point scale" as described below.

% of Marks obtained	Grade	Description of Grade	Grade Points (GP)
≥90	A+	Outstanding	10
≥80 to <90	A	Excellent	9
≥70 to < 80	B	Very Good	8
≥ 60 to < 70	C	Good	7
≥ 50 to < 60	D	Fair	6
≥ 40 to < 50	E	Satisfactory	5
< 40	F	Fail	0
Absent	N	Absent	0
For Mandatory Courses			
≥40	P	Satisfactory	-
<40	I	Not Satisfactory	-
For NCC/NSS Activities			
Participated	P	Satisfactory	-
Not Participated	I	Not Satisfactory	-
For Internship			
Submission of Certificate	P	Completed	
Non-Submission of Certificate	I	Incomplete	

Pass Marks:

A student shall be declared to have passed theory course, laboratory course, and project work if he secures minimum of 35% marks (Rounded off to lower integer number) in external examination, and a minimum of 40% marks in the sum total of internal evaluation and external examination taken together. Otherwise, he shall be

awarded fail grade - '**F'** in such a course irrespective of internal marks. '**F'** is considered as a fail grade indicating that the student has to pass the Semester-End Examination in that course in future and obtain a grade other than '**F'** and '**N'** for passing the course.

For the Mandatory Courses, if the student obtained 40% or more marks, then his performance shall be indicated as "P" (SATISFACTORY), otherwise the performance shall be indicated as "I" (NOT SATISFACTORY) in the grade sheet.

For the NCC/NSS Activities, if the student participate in the activities, then his performance shall be indicated as "P" (SATISFACTORY), otherwise the performance shall be indicated as "I" (NOT SATISFACTORY) in the grade sheet.

For the Internship, if the student submit Certificate, then his performance shall be indicated as "P" (COMPLETED), otherwise the performance shall be indicated as "I" (INCOMPLETE) in the grade sheet.

17.2. Semester Grade Point Average (SGPA): SGPA shall be calculated as given below on a "10 point scale" as an index of the student's performance:

$$SGPA = \frac{\sum(C\ X\ GP)}{\sum C}$$

Where "C" denotes the "credits" assigned to the courses undertaken in that semester and "GP" denotes the "grade points" earned by the student in the respective courses.

Note: SGPA is calculated only for the candidates who appearedin the semester-end regular examinations in a particular semester:

17.3. Cumulative Grade Point Average (CGPA):

The CGPA shall be calculated for a candidate who appearedin the Semester-end examination (including Regular & Supplementary) till that semester. The CGPA shall be displayed in the Grade sheet of the Regular Semester-end examinations and also in the consolidated Grade Sheet issued at the end of the program. The CGPA is computed on a 10 point scale as given below:

$$CGPA = \frac{\sum(C\ X\ GP)}{\sum C}$$

Where, C denotes the credits assigned to courses undertaken up to the end of the Program and GP denotes the grade points earned by the student in the respective courses.

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

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

Equivalent Percentage = (CGPA – 0.50) x 10

18. Grade Sheet: A grade sheet (Marks Memorandum) shall be issued to each student indicating the SGPA and CGPA, provided if he passed all the courses registered in the regular semester-end examinations.

19. Consolidated Grade Sheet: After successful completion of the entire Program of study, a Consolidated Grade Sheet indicating performance of all academic years shall be issued as a final record. Duplicate Consolidated Grade Sheet shall also be issued, if required, after payment of requisite fee.

20. Award of Degree: The Degree shall be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on the recommendations of the Chairman, Academic Council, SVEC (Autonomous).

20.1. Eligibility: A student shall be eligible for the award of B.Tech Degree if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the Program of study to which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained CGPA greater than or equal to 4.0 (Minimum requirement for declaring as passed).
- Has NO DUES to the College, Hostel, Library etc. and to any other amenities provided by the College.
- No disciplinary action is pending against him.

20.2. Award of Class: Awarding of Class is based on CGPA.

Awarding of Class

CGPA Secured	Class Awarded
≥7.5	First Class with Distinction
≥6.5 and <7.5	First Class
≥5.5 and <6.5	Second Class
≥5.0 and <5.5	Pass Class

21. Additional Academic Regulations:

21.1. A student may appear for any number of supplementary examinations within the stipulated time to fulfill regulatory requirements for award of the degree.

21.2. In case of malpractice/improper conduct during the examinations, guidelines shall be followed as given in the ANNEXURE-I.

21.3. When a student is absent for any examination (Mid-term or Semester-end) he shall be awarded zero marks in that component (course) and grading shall be done accordingly.

21.4. When a component is cancelled as a penalty, he shall be awarded zero marks in that component.

22. Withholding of Results:

If the candidate has not paid dues to the College/University (or) if any case of indiscipline is pending against him, the result of the candidate shall be withheld and he shall not be allowed/promoted to the next higher semester.

23. Re-Registration for Improvement of Internal Marks:

Following are the conditions to avail the benefit of improvement of internal marks.

23.1. The candidate should have completed the 4 years of B.Tech course work and obtained examinations results from I B.Tech I Semester to IV B.Tech II semester.

23.2. Out of the courses the candidate has failed in the examinations due to internal evaluation marks secured being less than 40%, the candidate shall be given a chance for improvement of internal evaluation marks in the failed theory courses.

23.3. This provision is only for Theory courses. The candidate has to register for the chosen courses and fulfil the academic requirements (i.e. a student has to attend the classes regularly and appear for the mid-examinations and satisfy the attendance requirements to become eligible for appearing at the semester-end examinations).

23.4. For each course, the candidate has to pay a fee of Rs. 10,000/- and the amount is to be remitted in the form of D.D. in favor of the Principal, Sree Vidyanikethan Engineering College payable at Tirupati along with the requisition through the concerned Head of the Department.

23.5. In the event of availing the provision of Improvement of Internal evaluation marks, the internal evaluation marks as well as the Semester-end Examinations marks secured in the previous attempt(s) for the re-registered courses shall stand cancelled.

24. Amendments to Regulations:

The Academic Council of SVEC(Autonomous) reserves the right to revise, amend or change the Regulations, Scheme of Examinations, and / or Syllabi or any other policy relevant to the needs of the society or industrial requirements etc., with the recommendations of the concerned Board(s) of Studies.

25. General:

The words such as "he", "him", "his" and "himself" shall be understood to include all students irrespective of gender connotation.

Note: Failure to read and understand the regulations is not an excuse.

ANNEXURE-I

GUIDELINES FOR DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

Rule No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course 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 course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course 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 course 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 course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate is to be cancelled.
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 for four consecutive semesters from class work and all Semester-end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including labs and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for four consecutive semesters from class work and all Semester-end examinations, if his involvement is established. Otherwise, The candidate is debarred for two consecutive semesters from class work and all Semester-end 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the

		courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester-end 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 course only.
6.	Refuses to obey the orders of the Chief Controller of Examinations/Controller of Examinations/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 Controller of Examinations 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 representation, assaults the Controller of Examinations, 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.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. If the candidate physically assaults the invigilator/Controller of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester-end 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred and forfeits the seat.

Note: Whenever the performance of a student is cancelled in any course(s) due to Malpractice, he has to register for Semester-end Examinations in that course(s) consequently and has to fulfill all the norms required for the award of Degree.

SVEC20 CURRICULUM
Course Structure for B.Tech. in Civil Engineering
(Effective from the Academic year 2020-21 onwards)

Mandatory Induction Program	03 Weeks Duration
Induction program offered before commencement of the I-Semester course work	Physical Activity
	Creative Arts
	Universal Human Values
	Literary
	Proficiency Modules
	Lectures by Eminent People
	Visits to Local Areas
	Familiarization to Department/Branch and Innovations

COURSE STRUCTURE

I B.Tech. – I Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT1BS01	Differential Equations and Multivariable Calculus	3	-	-	3	3	30	70	100
2.	20BT1BS02	Engineering Chemistry	3	-	-	3	3	30	70	100
3.	20BT1BS04	Applied Physics	3	-	-	3	3	30	70	100
4.	20BT10101	Engineering Mechanics	3	-	-	3	3	30	70	100
5.	20BT1BS31	Engineering Chemistry Lab	-	-	3	3	1.5	30	70	100
6.	20BT1BS33	Applied Physics Lab	-	-	3	3	1.5	30	70	100
7.	20BT10331	Computer Aided Engineering Drawing	-	1	4	5	3	30	70	100
8.	20BT10332	Engineering Workshop	-	-	3	3	1.5	30	70	100
9.	20BT1HSAC	Spoken English(Audit Course)	2	-	-	2	-	-	-	-
Total:			**14**	**1**	**13**	**28**	**19.5**	**240**	**560**	**800**

I B.Tech. – II Semester

Sl. No.	Course Code	Course Title	Contact Periods per week				C	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT2BS01	Transformation Techniques and Linear Algebra	3	-	-	3	3	30	70	100
2.	20BT1HS01	Communicative English	3	-	-	3	3	30	70	100
3.	20BT10201	Basic Electrical and Electronics Engineering	3	-	-	3	3	30	70	100
4.	20BT20541	Programming in C and Data Structures	3	-	-	3	3	30	70	100
5.	20BT20101	Civil Engineering Materials and Concrete Technology	3	-	-	3	3	30	70	100
6.	20BT1HS31	Communicative English Lab	-	-	3	3	1.5	30	70	100
7.	20BT20551	Programming in C and Data Structures Lab	-	-	3	3	1.5	30	70	100
8.	20BT20131	Engineering Geology Lab	-	-	3	3	1.5	30	70	100
9.	20BT1MC01	Universal Human Values (Mandatory Course)	2	-	-	2	-	30	-	30
Total:			**17**	**-**	**09**	**26**	**19.5**	**270**	**560**	**830**

II B.Tech. –ISemester

S. No.	Course Code	Course Title	Contact Periods per Week				Credits (c)	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT3BS01	Numerical Methods, Probability and Statistics	3	-	-	3	3	30	70	100
2.	20BT30101	Construction, Planning and Project Management	3	-	-	3	3	30	70	100
3.	20BT30102	Fluid Mechanics and Hydraulic Machinery	3	-	-	3	3	30	70	100
4.	20BT30103	Mechanics of Solids	3	-	-	3	3	30	70	100
5.	20BT30104	Surveying	3	-	-	3	3	30	70	100
6.	20BT30131	Civil Engineering Materials and Construction Technology Lab	-	-	3	3	1.5	30	70	100
7.	20BT30132	Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	3	1.5	30	70	100
8.	20BT30133	Surveying Lab	-	-	3	3	1.5	30	70	100
9.	20BT3HS31	Soft Skills Lab	-	1	2	3	2	30	70	100
		Total	**15**	**0**	**9**	**27**	**21.5**	**270**	**630**	**900**
10.	20BT3MC01	Environmental Science	2	-	-	2	-	30	-	30

II B.Tech. – II Semester

S. No.	Course Code	Course Title	Contact Periods per Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT40101	Engineering Hydrology	3	-	-	3	3	30	70	100
2.	20BT40102	Environmental Engineering	3	-	-	3	3	30	70	100
3.	20BT40103	Soil Mechanics	3	-	-	3	3	30	70	100
4.	20BT40104	Structural Analysis	3	-	-	3	3	30	70	100
5.	**Open Elective-1**		3	-	-	3	3	30	70	100
6.	20BT40131	Environmental Engineering Lab	-	-	3	3	1.5	30	70	100
7.	20BT40132	Geotechnical Engineering Lab	-	-	3	3	1.5	30	70	100
8.	20BT40133	Strength of Materials Lab	-	-	3	3	1.5	30	70	100
9.	20BT40134	Advanced Surveying Practice	-	1	2	3	2	30	70	100
		Total	**15**	**1**	**11**	**24**	**21.5**	**270**	**630**	**900**

10.	20BT315AC	Design Thinking	2	-	-	2	-	-	-	-

III B.Tech. – I Semester

S. No.	Course Code	Course Title	Contact Periods per Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT50101	Foundation Engineering	3	-	-	3	3	30	70	100
2.	20BT50102	Reinforced Cement Concrete Structures	3	-	-	3	3	30	70	100
3.	20BT50103	Transportation Engineering	3	-	-	3	3	30	70	100
4.	**Open Elective-2**		3	-	-	3	3	30	70	100
5.	**Interdisciplinary Elective-1**		3	-	-	3	3	30	70	100
	20BT50442	Principles of Image Processing								
	20BT50202	Energy Audit, Conservation and Management								
	20BT70302	Computational Fluid Dynamics								
	20BT50104	Construction Equipment and Automation								
	20BT50105	Pipeline Engineering								
6.	20BT50131	Computer Aided Building Planning and Drawing	-	-	3	3	1.5	30	70	100
7.	20BT50132	Transportation Engineering Lab	-	-	3	3	1.5	30	70	100
8.	20BT50133	MATLAB Practice for Civil Engineers	-	1	2	3	2	30	70	100
9.	20BT50134	Summer Internship-I	-	-	-	-	1.5	-	100	100
		Total	**15**	**1**	**8**	**24**	**21.5**	**240**	**660**	**900**
10.	20BT503AC	Foundations ofEntrepreneurship	2	-	-	2	-	-	-	-
11.	20BT4N501	NCC/NSS Activities								

III B.Tech. – II Semester

S. No.	Course Code	Course Title	Contact Periods per Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT5HS01	Organizational Behaviour	3	-	-	3	3	30	70	100
2.	20BT60101	Irrigation Engineering and Hydraulic Structures	3	-	-	3	3	30	70	100
3.	20BT60102	Steel Structures	3	-	-	3	3	30	70	100
4.	**Professional Elective-1**		3	-	-	3	3	30	70	100
	20BT60103	Advanced Structural Analysis								
	20BT60104	Advanced Surveying								
	20BT60105	Air and Noise Pollution and Control								
	20BT60106	Architecture and Town Planning								
	20BT60107	Ground Improvement Techniques								
	20BT60108	Urban Stormwater Management								
	20BT60109	Railway Engineering								
5.	**Professional Elective-2**		3	-	-	3	3	30	70	100
	20BT60110	Advanced Reinforced Cement Concrete Structures								
	20BT60111	Geoenvironmental Engineering								
	20BT60112	Global Positioning System (GPS)								
	20BT60113	Groundwater Development and Management								
	20BT60114	Rehabilitation and Retrofitting of Structures								
	20BT60115	Solid and Hazardous Waste Management								
	20BT60116	Transportation Planning and Management								
6.	**Interdisciplinary Elective-2**		3	-	-	3	3	30	70	100
	20BT60314	Optimization Techniques								
	20BT60344	Thermodynamics and Heat Transfer								
	20BT60117	Fire Engineering								
	20BT60118	Intelligent Transportation Systems								
	20BT60119	Smart Materials and Structures								
7.	20BT60131	Civil Engineering Software	-	-	3	3	1.5	30	70	100

		Lab								
8.	20BT60132	Concrete Technology Lab	-	-	3	3	1.5	30	70	100
9.	20BT51551	Internet of Things Lab	-	1	2	3	2	30	70	100
		Total	**18**	**1**	**8**	**27**	**23**	**270**	**630**	**900**
10.	20BT5MC01	Professional Ethics	2	-	-	2	-	30	-	30

IV B.Tech. – I Semester

S. No.	Course Code	Course Title	Contact Periods per Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT5HS02	Principles of Business Economics and Accountancy	3	-	-	3	3	30	70	100
2.	20BT70101	Estimation and Quantity Surveying	3	-	-	3	3	30	70	100
3.	**Professional Elective-3**		3	-	-	3	3	30	70	100
	20BT70102	Earthquake Resistant Design of Structures								
	20BT70103	Highway Construction and Maintenance								
	20BT70104	Industrial Wastewater Treatment								
	20BT70105	Infrastructure Development and Management								
	20BT70106	Land Survey and Real Estate Development								
	20BT70107	Soil Dynamics and Machine Foundations								
	20BT70108	Sustainable Water Resources Development								
4.	**Professional Elective-4**		3	-	-	3	3	30	70	100
	20BT70109	Advanced Foundation Engineering								
	20BT70110	Advanced Steel Structures								
	20BT70111	Environmental Hydraulics								
	20BT70112	Pavement Analysis and Design								
	20BT70113	Prestressed Concrete								
	20BT70114	River Engineering and River Basin Management								
	20BT70115	Structural Health Monitoring								
5.	**Professional Elective- 5**		3	-	-	3	3	30	70	100
	20BT70116	Analysis and Design of CompositeStructures								
	20BT70117	Bridge Engineering								
	20BT70118	Civil Infrastructure for Smart City Development								
	20BT70119	Environmental Impact Assessment and Management								
	20BT70120	Geotechnics for Underground Structures								
	20BT70121	Traffic Engineering and Management								

	20BT70122	Water Resources Systems Planning and Management								
6.	20BT70131	Computer Aided Design and Detailing Lab	-	-	3	3	1.5	30	70	100
7.	20BT70132	Remote Sensing and Geographical Information Systems Lab	-	-	3	3	1.5	30	70	100
8.	20BT70123	Geospatial Technologies	2	-	-	2	2	30	70	100
9.	20BT70133	Summer Internship-II	-	-	-	-	1.5	-	100	100
Total			**17**	**-**	**6**	**23**	**21.5**	**240**	**660**	**900**
10.	20BT701AC	Spread Sheet Applications in Civil Engineering	2	-	-	2	-	-	-	-

IV B.Tech. II–Semester

S. No.	Course Code	Course Title	Contact Periods per Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Int. Marks	Ext. Marks	Total Marks
1.	20BT80131	Project Work	-	-	-	-	12	100	100	200
2.	20BT80132	Internship	-	-	-	-	-	-	-	-
Total			**-**	**-**	**-**	**-**	**12**	**100**	**100**	**200**

LIST OF COURSES FOR

OPEN ELECTIVE–1 AND OPEN ELECTIVE-2

Course Code	Open Elective -1	Course Code	Open Elective -2
20BT4BS01	Material Science	20BT4HS01	Banking and Insurance
20BT4HS02	Business Communication and Career Skills	20BT4HS03	Cost Accounting and Financial Management
20BT4HS04	Entrepreneurship for Micro, Small and Medium Enterprises	20BT4HS05	Gender and Environment
20BT4HS06	German Language	20BT4HS07	Indian Economy
20BT4HS08	Indian History	20BT4HS09	Life Skills
20BT4HS10	Personality Development	20BT4HS11	Indian Tradition and Culture
20BT4HS12	Women Empowerment	20BT4HS13	Constitution of India
20BT40205	Reliability and Safety Engineering	20BT50106	Disaster Mitigation and Management
20BT40105	Environmental Pollution and Control	20BT50107	Sustainable Engineering
20BT40106	Planning for Sustainable Development	20BT50108	Contract Laws and Regulations
20BT40107	Rural Technology	20BT50310	Global Strategy and Technology
20BT40305	Human Resource Management	20BT50311	Management Science
20BT50506	Ethical Hacking	20BT40502	Cyber Laws and Security
20BT51205	AI in Healthcare	20BT50206	Intellectual Property Rights
20BT51501	Bioinformatics	20BT50406	Green Technologies

I B. Tech. - I Semester

(20BT1BS01)**DIFFERENTIAL EQUATIONS AND MULTIVARIABLE CALCULUS**

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITE:-

COURSE DESCRIPTION: Ordinary Differential Equations; Partial Differential Equations; Multivariable Calculus (Differentiation); Multivariable Calculus (Integration); Multivariable Calculus (Vector Calculus).

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Solve the higher order linear differential equations and identify solutions by analytical methods related to various engineering problems involving electrical circuits.
CO2. Formulate and solve partial differential equations for engineering problems.
CO3. Determine maxima and minima of functions of two variables and analyze their behaviour at extreme values.
CO4. Evaluate and apply multiple integrals to determine areas of plane curves.
CO5. Identify solenoidal and irrotational vector fields and apply vector integral theorems in evaluating areas and volumes.

Mapping of COs with POs

Course Outcome	**Program Outcomes**											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	1	-	-	-	-	-	-	-
CO2	3	3	-	-	1	-	-	-	-	-	-	-
CO3	2	3	-	-	1	-	-	-	-	-	-	-
CO4	2	3	-	-	1	-	-	-	-	-	-	-
CO5	3	2	-	-	1	-	-	-	-	-	-	-
Average	2.60	2.60	-	-	1	-	-	-	-	-	-	-
Course Correlation Level	3	3	-	-	1	-	-	-	-	-	-	-

Correlation Level: 3-High 2-Medium 1-Low

DETAILED SYLLABUS

UNIT - I: ORDINARY DIFFERENTIAL EQUATIONS (09 Periods)

Ordinary Differential Equation: Order and Degree of Differential Equation; Second and higher order linear differential equations with constant coefficients: Non-Homogeneous equations with R.H.S terms of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials in x,

$e^{ax}V(x)$ *and* $xV(x)$; method of variation of parameters; Equations reducible to linear differential equations with constant coefficients: Cauchy's homogeneous and Legendre's linear equations; Applications to L-C-R Circuit problems.

UNIT - II: PARTIAL DIFFERENTIAL EQUATIONS (09 Periods)

Formation of PDE, solutions of first order linear PDEs, Solution to homogenous and non-homogenous linear partial differential equations of second and higher order by complimentary function and particular integral method, method of Separation of variables in Cartesian coordinates.

UNIT - III: MULTIVARIABLE CALCULUS (DIFFERENTIATION) (09 Periods)

Partial derivatives, Chain rule, Total derivative, Jacobian, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT - IV: MULTIVARIABLE CALCULUS (INTEGRATION) (09 Periods)

Evaluation of Double integrals (Cartesian and polar coordinates), Change of order of integration (Cartesian form only); Evaluation of Triple integrals; Change of variables: double integration from Cartesian to polar coordinates, Triple integration from Cartesian to spherical polar coordinates; Areas enclosed by plane curves.

UNIT - V: MULTIVARIABLE CALCULUS (VECTOR CALCULUS) (09 Periods)

Vector Differentiation: Scalar and Vector fields: Gradient of a scalar field, directional derivative, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, Laplacian operator.

Vector Integration: Line integral - circulation-work done, Surface integral and Volume integral; Vector integral theorems: Theorems of Green, Gauss and Stokes (without proofs)-Problems related to theorems.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M.V.S.S.N. Prasad, *Engineering Mathematics, vol-1*, S. Chand and Company, 13thEdition, 2014.
2. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th Edition, 2017.

REFERENCE BOOKS:

1. Dennis G. Zill and Warren S. Wright, *Advanced Engineering Mathematics*, Jones and Bartlett, 6th edition, 2011.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Alpha Science International Ltd., 6th edition, 2017.
3. Erwin kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9th edition, 2006.

I B. Tech. – I Semester

(20BT1BS02) **ENGINEERING CHEMISTRY**

(Common to CE, ME, CSE, CSSE, IT, CSE(IOT), CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITE:-

COURSE DESCRIPTION: Water Treatment; Atomic Structure and Bonding Theories; Electrochemistry and Applications; Corrosion; Instrumental Methods and Applications; Fuel chemistry and Lubricants.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze and solve problems associated with hardness of water, boiler troubles and address the societal, health and safety issues related to quality of water.

CO2. Apply the basic knowledge of quantum mechanical approach to atomic structure and bonding theories to identify shapes of different molecules.

CO3. Apply the basic knowledge of corrosion phenomenon to identify solutions for control of corrosion and demonstrate competency in the basic concepts of electrochemical cells.

CO4. Demonstrate the basic knowledge of instrumental methods and their applications in the structural analysis of materials.

CO5. Apply the basic knowledge of fuel chemistry and lubricants to identify the quality of fuels and lubricants.

Mapping of COs with POs

Course Outcome	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*
CO1	3	2	-	-	-	2	1	-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	1	-	-	-	-	-	-
CO4	3	-	-	-	1	-	-	-	-	-	-	-
CO5	3	1	-	-	-	1	-	-	-	-	-	-
Average	3.0	1.25	-	-	1.0	1.33	1.0	-	-	-	-	-
Course Correlation Level	3	2	-	-	1	2	1	-	-	-	-	-

Correlation Level: 3-High 2-Medium 1-Low

DETAILED SYLLABUS:

UNIT - I: WATER TREATMENT **(10 Periods)**

Introduction, types of water, Impurities in water and their consequences. Hardness of water, units of hardness, disadvantages of hardness, measurement of hardness by EDTA method, numerical problems on measurement of hardness of water; Boiler troubles; softening of water– Ion exchange process, zeolite process, desalination of brackish water by reverse osmosis, specifications of potable water as per WHO and BIS standards. Fluoride in ground water: Effects on human health, defluoridation method – Nalgonda method; merits and demerits of various defluoridation methods.

UNIT - II: ATOMIC STRUCTURE AND BONDING THEORIES (09 Periods)

Quantum-mechanical model of atom, Schrodinger wave equation, significance of Ψ and Ψ^2 , applications to particle in a box; Molecular orbital theory – bonding in homo and hetero nuclear diatomic molecules – energy level diagrams of N_2, O_2, NO and CO; Π-molecular orbitals of butadiene and benzene; VSEPR theory and molecular shapes.

UNIT - III: ELECTROCHEMISTRY AND APPLICATIONS (09 Periods)

Introduction, Electrode potential, Nernst equation, reference electrode-Calomel electrode, electrochemical cell; Battery– Leclanche cell, lithium ion batteries; Fuel cells-Hydrogen-oxygen fuel cell, Solid-oxide fuel cell.

Corrosion: Introduction, Definition, types of corrosion- wet (galvanic corrosion, concentration cell corrosion) and dry corrosion, Factors influencing corrosion, control of corrosion- sacrificial anodic protection, Impressed current cathodic protection, electroplating method (Nickel).

UNIT - IV: INSTRUMENTAL METHODS AND APPLICATIONS (09 Periods)

Introduction to spectroscopy–types of energy present in molecules, types of spectra, UV-Vis spectroscopy – principle (Beer-lamberts Law), types of electronic transitions, chromophore, auxochrome, Bathochromic shift, Hypsochromic shift, Instrumentation of UV-Vis spectrophotometer, applications; Infrared spectroscopy – principle, types of vibrational modes, group frequencies, Instrumentation of IR spectrophotometer, applications; principle and applications of physicochemical methods (SEM, TEM, X-ray diffraction).

UNIT - V: FUEL CHEMISTRY AND LUBRICANTS (08 Periods)

Fuel chemistry*:* Types of fuels, calorific value, numerical problems based on calorific value; Liquid fuels - cracking of oils (Thermal and Fixed-bed catalytic cracking), knocking and anti-knock agents, Octane and Cetane values, Synthetic petrol: Fischer-Tropsch method and Bergius process.

Lubricants*:*Definition, functions of lubricants, mechanism of lubrication, classification of lubricants and their applications, properties of lubricants – viscosity and viscosity index , flash and fire points, cloud and pour points, Aniline points, neutralization number and mechanical strength.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. P. C. Jain & Monika Jain*, Engineering Chemistry*, Dhanpat Rai Publishing Company(P) Ltd, New Delhi, 16th edition, 2013.
2. K.N. Jayaveera, G.V. Subba Reddy and C. Ramachandriah, *EngineeringChemistry,* Mc.Graw Hill Publishers, New Delhi.

REFERENCE BOOKS:

1. J. D. Lee, *Concise Inorganic Chemistry*, Oxford University Press, 5thEdition 2010.
2. Skoog and West, *Principles of Instrumental Analysis*, Thomson, 6thEdition, 2007.
3. Peter Atkins, Julio de Paula and James Keelar, *Atkins' Physical Chemistry*, Oxford University Press, 10th Edition, 2010.

I B. Tech. – I Semester

(20BT1BS04) **APPLIED PHYSICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES:-

COURSE DESCRIPTION: Fiber optics; Acoustics; Ultrasonics; Kinematics; Kinetics; Thermal Physics and Modern Engineering Materials.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the electromagnetic wave propagation in various types of Optical Fibers.
CO2. Apply the basic knowledge of acoustics and ultrasonics to provide solutions for various engineering problems.
CO3. Analyze and solve the problems associated with kinetics and kinematics.
CO4. Acquire the basic knowledge in several heat transfer mechanisms and heat conduction through the compound media.
CO5. Demonstrate the knowledge on characteristics and applications of modern engineering materials.

Mapping of COs with POs

Course Outcomes	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
Average	3	2	-	-	-	-	-	-	-	-	-	-
Course correlation Level	3	2	-	-	-	-	-	-	-	-	-	-

Correlation Level: 3 – High 2 – Medium 1 – Low

DETAILED SYLLABUS:

UNIT-I: FIBER OPTICS **(08 Periods)**

Introduction, structure of an optical fiber, total internal reflection, acceptance angle, acceptance cone and numerical aperture, modes of propagation, classification of optical fibers, V-number (qualitative), fabrication of optical fiber by double crucible technique, applications of optical fibers, sensors (temperature, displacement, liquid level detector).

UNIT-II: ACOUSTICS AND ULTRASONICS **(09 Periods)**

***Acoustics*:** Introduction, classification of sound, sound intensity level (decibel), reverberation, reverberation time, Sabine's formula (qualitative), absorption coefficient and its determination, factors affecting acoustics and their remedies, basic requirements of an acoustically good hall.

***Ultrasonics*:** Introduction to ultrasonic waves, production of ultrasonic waves by magnetostriction method, piezoelectric method, detection of ultrasonics (qualitative), industrial applications (ultrasonic welding, ultrasonic soldering and ultrasonic drilling).

UNIT-III: KINEMATICS AND KINETICS (10 Periods)

Kinematics of particles: Introduction, Rectilinear motion (displacement-time curve, velocity-time curve, acceleration-time curve), curvilinear motion (velocity and angle of projection, equation of trajectory path, horizontal range) - inclined projection (equation of trajectory, maximum height, time of flight of projectile, horizontal range, angle of projection).

Kinetics: Bodies in rectilinear translation, kinetics of bodies rotating about fixed axis, work, energy, power, work-energy equation for translation.

UNIT-IV: THERMAL PHYSICS (08 Periods)

Introduction, modes of heat transfer (conduction, convection and radiation), coefficient of thermal conductivity, rectilinear flow of heat along a uniform bar, thermal conductivity of bad conductor (Lee's disc method), heat conduction through compound media (materials in series and parallel).

UNIT - V:MODERN ENGINEERING MATERIALS (10 Periods)

Metallic glasses: Introduction, preparation of metallic glasses by RF sputtering technique, properties (structural, thermodynamic, mechanical, electrical, chemical and optical), applications of metallic glasses.

***Shape memory alloys (SMA)*:**Introduction, shape memory effect and its types, characteristics of SMA, properties of NiTi alloy, applications of SMA.

Composites: Introduction, types and applications.

Total periods: 45

Topics for Self-study are provided in the lesson plan

TEXT BOOKS:

1. M. N. Avadhanulu, P. G. Kshirsagar, T. V. S. Arun Murthy, *A Textbook of Engineering Physics* - S. Chand Publications, 11th edition, 2019.
2. S. S. Bhavikatti and K. G. Rajashekarappa, *Engineering Mechanics*, New AgeInternational Publishers, 2nd edition, 2015.

REFERENCE BOOKS:

1. B. K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Learning, 2012.
2. Brij Lal and N. Subrahmanyam, *Heat and Thermodynamics,* S. Chand and Company Ltd., 1995.
3. William D. Callister, Jr. David, G. Rethwisch, Material Science and Engineering 9th Edition, Wiley 2013.

I B. Tech. – I Semester

(20BT10101) **ENGINEERING MECHANICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Statics of Particles and Rigid Bodies; Support Reactions; Analysis of Perfect Frames; Friction; Centroid, Centre of Gravity and Moment of Inertia; Simple Stresses and Strains; Thin and Thick Cylinders.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze complex engineering problems related to statics of particles and rigid bodies for effective solutions using appropriate methods ensuring safety besides communicating effectively in graphical form.
CO2. Analyze complex friction problems for effective solutions ensuring safety besides communicating effectively in graphical form.
CO3. Analyze complex engineering problems related to sectional properties for effective solutions using appropriate methods besides communicating effectively in graphical form.
CO4. Analyze simple stresses and strains in structural elements to solve complex engineering problems using appropriate methods ensuring safety besides communicating effectively in graphical form.
CO5. Design cylinders to solve complex piping engineering problems employing appropriate methods ensuring safety besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		3	2	2				3			3		
CO2	4	2	3		3		2				3			3		
CO3	4	2	3		3	2					3			3		
CO4	4	2	3		3	2	2				3			3		
CO5	6	2	3	3	3	2	2				3			3		
Average		2	3	3	3	2	2				3			3		
Course correlation Level		2	3	3	3	2	2				3			3		

Correlation Levels: 3: H - High 2: M - Medium 1: L – Low

DETAILED SYLLABUS:

UNIT – I: STATICS (10 Periods)

Statics of Particles: Basic concepts, System of units, System of concurrent coplanar forces in plane, Resultant of forces, Laws of mechanics, Equilibrium of forces, Lami's theorem, Vectorial representation of forces.

Statics of Rigid Bodies: Moment of a force, Varignon's theorem, Moment of a couple, Vectorial representation of moments and couples, Coplanar non-concurrent forces, Equilibrium of rigid bodies, Types of supports and loads, Types of frames, Perfect frame analysis, Method of joints, Method of sections, Principle of virtual work.

UNIT – II: FRICTION (08 Periods)

Frictional force, Types of friction, Laws of friction, Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Applications: Body on horizontal/inclined plane, Two bodies in contact, Ladder friction, Wedge friction.

UNIT – III: CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA

(09 Periods)

Centroids of simple and composite areas, centre of gravity of bodies, Theorems of Pappus and Guldinus, Parallel axis and perpendicular axis theorems, Moment of Inertia of Composite areas, Radius of gyration – Section modulus, Mass Moment of Inertia of simple and composite masses.

UNIT – IV: SIMPLE STRESSES AND STRAINS (10 Periods)

Elasticity and plasticity, Types of stresses and strains, Hooke's law, Stress-strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio, Volumetric strain, Types of elastic moduli and relations, Bars of varying section, Composite bars, Temperature stresses, Strain energy - Gradual, sudden and impact loadings, Simple applications.

UNIT – V: THIN AND THICK CYLINDERS (08 Periods)

Thin Cylinders:Thin cylindrical shells, Longitudinal and circumferential stresses; Hoop, Longitudinal and volumetric strains; Changes in dimensions of thin cylinders.

Thick Cylinders: Lame's theory, Distribution of hoop and radial stresses across thickness, Design of thick cylinders, Compound cylinders, Difference of radii for shrinkage.

Total Periods: *45*

Topics for Self-study are provided in the lesson plan

TEXT BOOKS

1. S. S. Bhavikatti and K. G. Rajashekarappa, *Engineering Mechanics*, New Age International (P) Ltd., 3rd Edition, 2009.
2. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *Mechanics of Materials*, Laxmi Publications Pvt. Ltd., 2001.

REFERENCE BOOKS:

1. J. L. Meriam and L. G. Kraige, *Engineering Mechanics: Statics (Vol. 1)*, Dynamics (Vol. 2), John Wiley & Sons Ltd., 5th Edition, 2008.
2. S. Rajasekaran and G. Sankarasubramanian, *Engineering Mechanics – Statics and Dynamics,* Vikas Publishing House Pvt. Ltd., 3rd Edition, 2009.
3. Bhavikatti, S. S., *Strength of Materials*, Vikas Publishing House, 3rd Edition, 2010.
4. Junnarkar, S. B. and Shah, H. J., *Mechanics of Structures – Vol. I (Strength of Materials)*, Charotar Publishing House Pvt. Ltd., 27th Revised and Enlarged Edition, 2008.

ADDITIONAL LEARNING RESOURCES:

1. Arthur P. Boresi and Richard J. Schmidt, *Engineering Mechanics - Statics and Dynamics,* Cengage Learning, 1st Edition, Indian Edition, 2008.

2. K. Vijaya Kumar Reddy and J. Suresh Kumar, *Singer's Engineering Mechanics - Statics and Dynamics*, BS Publications, 3rd Edition, 2010.
3. S. Timoshenko, D. H. Young and J. V. Rao, *Engineering Mechanics*, Tata McGraw-Hill Education Pvt. Ltd., Revised 4th Edition, Special Indian Edition, 2007.
4. Rajput, R. K., *Strength of Materials (Mechanics of Solids)*, S. Chand & Company LTD, 5th Edition, 2006.
5. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, 9th Edition, Dhanpat Rai Publishing Co. Ltd., 2014.
6. Basu, A. R., *Strength of Materials*, Dhanpat Rai & Co. (P) LTD., 2nd Revised Edition, 2015.

I B. Tech. – I Semester

(20BT1BS31) **ENGINEERING CHEMISTRY LAB**

(Common to CE, ME, CSE, CSSE, IT, CSE(IOT), CS&D and CSE(CS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE REQUISITE:-

COURSE DESCRIPTION: Estimation of hardness ground water sample, alkalinity, dissolved oxygen of water samples, Iron, residual chlorine in drinking water and Strength of an acid in Pb-Acid battery by volumetric methods; Instrumental methods like conductivity meter, potentiometer, P^H meter and colorimeter; Measurement of viscosity of lubricants; and Determination of the influence of pH on metallic corrosion.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply analytical skills for the quantitative estimation of materials through volumetric methods of analysis and address the societal, health issues related to quality of water.

CO2. Develop analytical skills for the quantitative estimation of materials through instrumental methods of analysis.

CO3. Work independently and in teams to solve problems with effective communication.

Mapping of COs with POs

Course Outcome	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*
CO1	3	3	-	-	-	2	1	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-
Average	3.0	3.0	-	-	2.0	2.0	1.0	2.0	2.0	2.0	-	-
Course Correlation Level	3	3	-	-	2	2	1	2	2	2	-	-

Correlation Level: 3-High 2-Medium 1-Low

A minimum of any **Ten**experiments are to be conducted among the following:

List of Experiments

1. Determination of hardness of ground water sample
2. Determination of alkalinity of Water sample
3. Estimation of Dissolved Oxygen in water by Winkler's method.
4. Estimation Fe (II) by Dichrometry
5. Estimation of residual chlorine in drinking water
6. Conductometric titration of strong acid Vs strong base
7. Estimation of Ferrous ion by Potentiometry
8. Determination of percentage of Iron in Cement sample by colorimetry
9. Determination of strength of acid by pHmetric method
10. Determination of Viscosity of liquids by Ostwald's viscometer
11. Determination of Strength of an acid in Pb-Acid battery
12. Determination of the influence of pH on metallic corrosion

TEXT BOOK:

1. Engineering Chemistry lab Manual (SVEC-20)

REFERENCE BOOKS:

1. K. Mukkanti, *Practical Engineering Chemistry*, BS Publications, 2013.
2. K.N. Jayaveera, K.B. Chandra Sekhar, *Chemistry laboratory manual*, S.M.Enterprises Limited, 2013.

I B. Tech. – I Semester

(20BT1BS33) **APPLIED PHYSICS LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE REQUISITE:-

COURSE DESCRIPTION: Determination of acceleration due to gravity using Compound Pendulum; Moment of inertia of a Flywheel; rectangular body using Bifilar Pendulum; Rigidity Modulus of a wire using Torsional Pendulum and frequency of electrically vibrating tuning fork; Thermal conductivity of a bad conductor (Lee's disc method); Seebeck Effect using Thermocouple; Verification of Newton's Law of Cooling for any two liquids; Characteristics of Optical fiber; Experimental determination of carrier concentration and energy gap of a material by varying temperatures and Determination of spring constant of springs using Coupled Oscillator.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the experimental procedures to compute the frequency of a tuning fork, hall coefficient, energy gap, moment of inertia, rigidity modulus and thermal conductivity of materials.

CO2. Apply skills to plot various characteristic curves of an optical Fiber and also determine thermal conductivity, thermo emf and energy gap.

CO3. Work independently and in teams to solve problems with effective communication.

Mapping of COs with POs

Course Outcome	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	2	2	2	-	-
Average	3.0	3.0	-	-	-	-	-	2.0	2.0	2.0	-	-
Course Correlation Level	3	3	-	-	-	-	-	2	2	2	-	-

Correlation Level: 3-High 2-Medium 1-Low

A minimum of **Ten** experiments are to be conducted among the following:

List of Experiments:

1. Determination of moment of inertia of a bar and acceleration due to gravity - Compound Pendulum.
2. Moment of inertia of a Flywheel.
3. Bifilar Pendulum - Moment of inertia of a rectangular body.
4. Melde's Experiment – Determine the frequency of electrically driven tuning fork.
5. Determination of thermal conductivity of a bad conductor (Lee's disc method).
6. Estimate the acceptance angle of an optical fiber.
7. Verification of Newton's Law of Cooling for any two liquids.
8. Determination of number of charge carriers per unit volume and hall coefficients of a given material using Hall Effect.
9. Rigidity Modulus of a material of a wire - Torsional Pendulum

10. Thermocouple - Seebeck Effect.
11. Determine the energy gap of a material by varying temperatures.
12. Determination of spring constant of springs using Coupled Oscillator.

TEXT BOOK:

1. Applied Physics Lab Manuel (SVEC-20)

REFERENCES:

1. Balasubramanian S, Srinivasan M.N and Ranganathan, *A Text Book of Practical Physics,* R. Sultan Chand & Sons, 2017.
2. https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=354&cnt=1

I B. Tech. – I Semester

(20BT10331)**COMPUTER AIDED ENGINEERING DRAWING**

(Common to CE, ME, EEE, ECE, EIE, CSE(IOT) and CS&D)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	1	4	3

PRE-REQUISITES:**-**

COURSE DESCRIPTION: Engineering drawing conventions; Importance of engineering drawing; fundamental concepts of sketching; computer aided drafting and different types of projections of geometric entities (both 2D and 3D) through computer aided drafting packages.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the principles of engineering drawing, Methods and CAD tools to draw the Geometries, Curves and Orthographic projections used to communicate in engineering field.
CO2. Develop lateral surfaces of solids and draw Isometric views of given objects for engineering communication using principles of engineering drawing and CAD tools.
CO3. Work independently / in groups & communicate effectively in oral and writtenforms.

Mapping of COs with POs

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	1	-	-	-	-	-	-
CO2	3	3	2	1	3	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-
Average	3	3	2	1	3	1	-	-	3	3	-	-
Correlation level	3	3	2	1	3	1	-	-	3	3	-	-

Correlation Levels: 3– High 2 – Medium 1– Low

DETAILED SYLLABUS:

Introduction to Engineering Graphics and Design:

Principles, Significance-Conventions in drawing-lettering - BIS conventions-Dimensioning principles and conventional representations.

Exercises:

1. Practice exercise on Basic Lettering and Dimensioning
2. Practice exercise on Conventional representations

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

Exercises:

3. Practice exercise using basic drawing commands
4. Practice exercise using editing commands

CONICS, CURVES, PROJECTION OF POINTS, LINES AND PLANES

Conics & Special Curves:Conic sections including the rectangular hyperbola-eccentricity method only; Cycloid, Epicycloid and Hypocycloid, Involutes.

Exercises:

5. Practice exercises on Ellipse, Parabola, Hyperbola and Rectangular Hyperbola
6. Practice exercises on Cycloid, Epicycloid, Hypocycloid and Involutes

Projection of points, lines and planes:Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line, Projections of regular plane surfaces.

Exercises:

7. Practice exercises on Projection of points
8. Practice exercises on projection of lines inclined to one plane
9. Practice exercises on projection of lines inclined to both planes
10. Practice exercises on Projections of regular plane surfaces

PROJECTION OF SOLIDS AND SECTION OF SOLIDS

Projection of solids:Projection of regular solids inclined to one plane.

Sections of solids:Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone, True shapes of the sections.

Exercises:

11. Practice exercises on Projections of regular solids
12. Practice exercises on Sections of solids

DEVELOPMENT OF SURFACES

Development of surfaces:Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Exercises:

13. Practice exercises on Development of surfaces of right regular solids

ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS

Orthographic Projections:Systems of projections, conventions and application to orthographic projections.

Isometric Projections:Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

Exercises:

14. Practice exercises on Orthographic Projections
15. Practice exercises on Isometric Projections

TEXT BOOKS:

1. D. M. Kulkarni, A. P. Rastogi, A. K. Sarkar, *Engineering Graphics with AutoCAD*, PHI Learning Private Limited, New Delhi, Revised edition, 2010.
2. N. D. Bhatt and V. M. Panchal, *Engineering Drawing*, Charotar Publishing House, Gujarat, 51st edition, 2013.

REFERENCE BOOKS/LABORATORY MANUALS:

1. Sham Tickoo, *AutoCAD 2013 for Engineers and Designers*, Dreamtech Press, 2013.
2. M. H. Annaiah & Rajashekar Patil, *Computer Aided Engineering Drawing*, New Age International Publishers, 4thEdition, 2012.

I B. Tech. – I Semester
(20BT10332) **ENGINEERING WORKSHOP**

(Common to CE, ME, EEE, ECE, EIE, CSE(IOT) and CS&D)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES:-

COURSE DESCRIPTION: Knowledge on various workshop hand and power tools; hands on experience in different manufacturing trades such as fitting, carpentry, sheet metal forming and foundry; Demonstration on dismantling and assembling of various two wheeler parts, power tools in machining and metal joining, basics of plumbing and working of 3D printer.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design and model various basic prototypes in the trade of fitting such as square/half round mating, V- mating and dovetail mating from the given MS workpieces using fitting tools.
CO2. Develop different prototypes in the carpentry trade such as cross lap joint, dovetail / bridle joints and Mortise and Tenon joint using carpentry tools.
CO3. Design and model different prototypes in the sheet metal forming trade such as rectangular tray, square vessel/cylinder, Funnel as per the dimensions using sheet metal forming tools.
CO4. Develop sand mould using single piece pattern and split piece pattern in the foundry trade using foundry tools.
CO5. Develop electric circuits for series and stair case connections.
CO6. Demonstrate the knowledge on power tools, plumbing operation, 3D printing technology involved in different engineering applications.
CO7. Work independently / in groups & communicate effectively in oral and written forms.

Mapping of COs with POs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1		1							3		
CO2	3	3	3	1		1							3		
CO3	3	3	3	1		1							3		
CO4	3	3	3	1		1							3		
CO5	3	3	3	1		1							3		
CO6	3	1	1	1	1	1							3		
CO7									3	3			3		
Average	3	2.6	2.6	1	1	1			3	3			3		
Correlation level	3	3	3	1	1	1			3	3			3		

Correlation Levels: 3– High 2 - Medium 1– Low

DETAILED SYLLABUS:

FITTING: Conduct a detailed study on various aspects in fitting trade which includes the details of fitting operations, safety precautions, types of tools, tool holders, miscellaneous tools, care and maintenance of hand tools, marking and measurement tool, and finishing tool.

List of Exercises :

1. Make a square/half round mating from the given MS work pieces
2. Make a V- mating from the given MS work pieces

CARPENTRY: Conduct a detailed study on various aspects in carpentry trade which includes the details of types of wood, carpentry tools, wood working techniques, types of joints, safety precautions, and care and maintenance of tools.

List of Exercises:

3. Prepare a cross lap joint
4. Prepare dovetail / bridle joints

SHEET METAL FORMING: Conduct a detailed study on various aspects in sheet metal forming which includes the details of sheet materials, hand tools, sheet metal fabrication, and safety and precautions

List of Exercises:

5. Fabricate a rectangular tray as per the dimensions
6. Fabricate square vessel/cylinder as per the dimensions

FOUNDRY: Conduct a detailed study on various aspects in foundry which includes the details of moulding sand, properties of moulding sand, types of patterns and pattern, materials, foundry tools, and safety and precautions

List of Exercises:

7. Prepare a sand mould, using the given single piece pattern (stepped pulley/cube)
8. Prepare a sand mould, using the given split piece pattern (pipe bent/dumbbell)

ELECTRICAL WIRING: Prepare electrical wiring with associated devices such as switches, distribution boards, sockets, and light fittings in a structure considering safety standards for design and installation.

List of Exercises:

9. Prepare electrical circuits with Series.
10. Prepare electrical circuits with Stair case connections.

Demonstration:

11. Demonstrate the usage of power tools.
12. Demonstrate the plumbing operation and identify the essential tool and materials required for plumbing.
13. Demonstrate the working of 3D printer

Note: Student shall perform any **TwelveExercises**

REFERENCE BOOKS/LABORATORY MANUALS:

1. P. Kannaiah and K. L. Narayana, *Workshop Manual*, SciTech Publishers, 2009.
2. K. Venkata Reddy, *Workshop Practice Manual*, BS Publications, 2008.
3. V. Ramesh Babu, *Engineering Workshop Practice*, V R B Publishers Private Limited, 2009.

ADDITIONAL LEARNING RESOURCES:

1. R. K. Jain, *Production Technology*, Khanna Publishers, 17thEdition, 2012.
2. Kalpakjian, Serope, *Manufacturing Engineering and Technology*, Pearson Education, 7thEdition, 2014.

I B.Tech. - I Semester

(20BT1HSAC) **SPOKEN ENGLISH**

(Audit Course)

(Common to CE, ME, EEE, ECE, EIE, CSE(IOT) and CS&D)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES:-

COURSE DESCRIPTION: Grammar; Functional English; Paragraph writing; Letter writing and Email writing.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of grammar and vocabulary in writing effective formal letters and e-mails.

CO2. Communicate effectively by applying appropriate speaking and writing techniques by examining and applying functional English.

Mapping of COs with POs

Course Outcomes	Program Outcomes			
	PO1	**PO2**	**PO5**	**PO10**
CO1	3	1	1	1
CO2	2	3	1	2
Average	2.5	2	1	1.5
Correlation level	3	2	1	2

Correlation Level: 3-High 2-Medium 1-Low

DETAILED SYLLABUS:

UNIT– I: GRAMMAR (06 Periods)

Active voice and Passive voice – Auxiliary modals - Question Forms:Wh-word, Embedded, Yes/No - Disjunctive/Tags - Spotting Errors

UNIT– II: FUNCTIONAL ENGLISH (06 Periods)

Vocabulary Building: (Vegetables, groceries, fruits, Parts of human body, relations) Greetings - Introduction - Self and others - Story telling - Speaking Activities

UNIT– III:PARAGRAPH WRITING (06 Periods)

Topic sentence - cohesion and coherence - Unity - adequate development - Introduction to types -Compare-Contrast - Problem & Solution, Cause & Effect, Classification & Illustrative.

UNIT– IV: LETTER WRITING (06 Periods)

Components of an Effective Letter - Communication in everyday life - Personal Correspondence, Internal Communication - Career and Employment Letters

UNIT–V:EMAIL WRITING **(06 Periods)**

Do's & Don'ts - Tips for email effectiveness - Email Jargon - Sample Emails

Total Periods: 30

Topics for Self-study are provided in the lesson plan

TEXT BOOKS:

1. L. Adinarayana and V. Prakasam, *Spoken English*, Neelkamal Publications Pvt. Ltd., New Delhi, 2008
2. Ram Bhasker Raju, *The Complete Book on Spoken English*, Goutham BuddhaPublications, Hyderabad, 2002.

REFERENCE BOOKS :

1. Sabina Pillai, *Spoken English for My World,* Oxford University Press, New Delhi, 2016.
2. K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009.

ADDITIONAL LEARNING RESOURCES

1. https://www.britishcouncil.in/programmes/english-partnerships/state/skillsprojects/AP-English-Skills.
2. https://www.fluentu.com/blog/english/websites-to-learn-english/

I B. Tech. - II semester

(20BT2BS01) TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA

(Common to All Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITE:-

COURSE DESCRIPTION: Fourier Series and Fourier Transforms; Laplace Transforms; Inverse Laplace Transforms; Linear Algebra-I (Matrices); Linear Algebra-II (Vector Spaces).

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Construct the Fourier series for periodic functions and demonstrate the use of Fourier series and Fourier transform to connect the frequency and time domain systems.

CO2. Solve initial and boundary value problems in engineering fields through Laplace Transform techniques.

CO3. Apply the matrix theory in solving system of linear equations and determine the Eigen values and Eigen vectors.

CO4. Demonstrate the knowledge of Linear Transformations to intelligent systems.

Mapping of COs with POs

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	1	-	-	-	-	-	-	-
CO2	3	3	-	-	1	-	-	-	-	-	-	-
CO3	3	2	-	-	1	-	-	-	-	-	-	-
CO4	3	2	-	-	1	-	-	-	-	-	-	-
Average	3	2.5	-	-	1	-	-	-	-	-	-	-
Course Correlation Level	3	3	-	-	1	-	-	-	-	-	-	-

Correlation Level: 3-High 2-Medium 1-Low

DETAILED SYLLABUS:

UNIT- I: FOURIER SERIES AND FOURIER TRANSFORMS (09 Periods)

Fourier series: Determination of Fourier coefficients, Euler's formulae, convergence of Fourier series (Dirichlet's conditions), Fourier series in $(0,2\pi), (-\pi,\pi)$; Fourier series of even and odd functions; Half-range Fourier sine and cosine expansions in $(0,\pi)$; Fourier

integral theorem (statement only), Fourier sine and cosine integrals; Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.

UNIT-II: LAPLACE TRANSFORMS (09 Periods)

Definition of Laplace transforms, existence conditions, Laplace transforms of standard functions, Properties of Laplace transforms (without proofs), Laplace transforms of derivatives, Laplace transforms of integrals, multiplication by t^n, division by t, Laplace transforms of periodic functions, Laplace transforms of unit step function and unit impulse function.

UNIT- III: INVERSE LAPLACE TRANSFORMS (09 Periods)

Inverse Laplace transforms by different methods; Convolution theorem (without proof), inverse Laplace transforms by convolution theorem; Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT- IV: LINEAR ALGEBRA-I (MATRICES) (09 Periods)

Rank of a matrix: echelon form; Linear systems of equations: solving system of Homogeneous and Non-Homogeneous equations; Eigen values and Eigen vectors of a matrix and properties (without proofs), Diagonalization of a matrix by orthogonal transformation.

UNIT-V: LINEAR ALGEBRA-II (VECTOR SPACES) (09 Periods)

Vector spaces, Linear dependence and independence of vectors, basis, dimension, Linear transformations (maps), range and kernel of a linear map, rank and nullity, inverse of a linear transformation, rank-nullity theorem (without proof).

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S.N. Prasad, Engineering Mathematics-II, S. Chand & Company, 10thEdition, 2016.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEdition, 2017.
3. David Poole, Linear Algebra: A Modern Introduction, Brooks/Cole, 2nd Edition, 2005.

REFERENCE BOOKS:

1. B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw hill, 1stEdition, 2017.
2. V. Krishna Murthy, Mainra and Arora: *An Introduction to Linear Algebra*, Affiliated East-West Press, 1993.

I B. Tech. - II Semester

(20BT1HS01) **COMMUNICATIVE ENGLISH**

(Common to CE, ME, EEE, ECE, EIE, CSE(IOT) and CS&D)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Introduction to Communication; Active Listening; Effective Speaking; Reading and Technical Writing.

COURSE OUTCOMES: After successful completion of this course, students will be able to:

CO1. Demonstrate knowledge of English language, examining and applying the aspects of Process of communication, Paralinguistic features, Skimming, Scanning, and Elements of style in writing.

CO2. Analyze the modes and techniques of listening, speaking, reading, writing and apply them appropriately to communicate effectively with the engineering community and society.

CO3. Apply reading and writing techniques in preparing documents by examining SQ3R Technique, Writer's Block, and Précis Writing.

CO4. Communicate effectively in Conferences, Symposia, Seminars and in formal and real time situations by applying appropriate speaking techniques learnt by examining different communication styles used in similar contexts.

Mapping of COs with POs

Course Outcome	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*
CO1	2	-	-	-		-	-	-	-	-	-	-
CO2	1	3	-	-	-		-	-	-	-		-
CO3	1	1	-	-	2	-	-	-	-	-	-	-
CO4	1	1	-	-	2	-	-	-	-	3	-	1
Average	1.25	1.67	-	-	2.0	-	-	-	-	3	-	1
Correlation level	2	2	-	-	2	-	-	-	-	3	-	1

Correlation Level: 3-High 2-Medium 1-Low

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO COMMUNICATION (09 Periods)

Introduction – Language as a Tool of Communication – Communicative Skills (Listening, Speaking, Reading and Writing) – Effective Communication – Modes of Communication– Barriers to Communication (classification)

UNIT– II: ACTIVE LISTENING (09 Periods)

Introduction – Traits of a Good Listener – Listening Modes – Types of Listening– Barriers to Effective Listening – Listening for General Content and Specific Information

UNIT–III: EFFECTIVE SPEAKING (09 Periods)

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features– Barriers to Speaking – Types of Speaking – Conferences; significance, planning and preparation and procedure – Symposia and Seminars - Persuasive Speaking

UNIT– IV: READING (09 Periods)

Introduction – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading–Techniques for Good Comprehension – SQ3R Reading Technique–Study Skills

UNIT - V: TECHNICAL WRITING (09 Periods)

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Paragraphs Construction – Essays: types, Steps to Essay Writing and Checklist – Précis Writing

Total Periods: 45

Topics for Self-study are provided in the lesson plan.

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.
2. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt. Ltd., New Delhi, 2018.

REFERENCE BOOKS:

1. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press,New Delhi, 2013.
2. Rajendra Pal and J. S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Son, New Delhi, 2010.

ADDITIONAL LEARNING RESOURCES

1. https://www.skillsyouneed.com/ips/active-listening.html: A useful summary of what active listening skills are.
2. https://en.wikipedia.org/wiki/Active_listening:Wikipedia entry about active listening.
3. https://www.forbes.com/sites/womensmedia/2012/11/09/10-steps-to-effective-listening/#4b27a2503891: Ten steps to Active Listening (by Forbes magazine).
4. https://goo.gl/t1Uqrt: 20 tips for organizing a conference.
5. https://goo.gl/kPMr9u: 10 important issues for speakers at a conference.
6. https://goo/gl/C5bDvv: Wikihow guide to organizing a conference.

I B. Tech. –II Semester

(20BT10201) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to CE and CSBS)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:-

COURSE DESCRIPTION: Principles of Electrical Systems; AC & DC Machines; Semiconductor Devices and Op-Amps.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze electrical circuits by applying the conceptual knowledge of circuit concepts.
CO2. Demonstrate knowledge on various generation technologies, protection devices, safety procedures and BEE standards.
CO3. Demonstrate knowledge on characteristics and applications of transformers and AC machines.
CO4. Demonstrate knowledge on characteristics and applications of diode, BJT and Op-amps.

Mapping of COs with POs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-			
CO2	3	-	-	-	-	-	1	1	-	-	-	-			
CO3	3	-	-	-	-	1	-	-	-	-	-	-			
CO4	3	1	-	-	-	1	-	-	-	-	-	-			
Average	3	1	1	-	-	1	-	-	-	-	-	-			
Correlation level	3	1	1	-	-	1	-	-	-	-	-	-			

Correlation Level: 3-High 2-Medium 1-Low

DETAILED SYLLABUS:

UNIT-I:PRINCIPLES OF ELECTRICAL SYSTEMS-I (09 Periods)

Basic electrical sources: DC-Battery, AC sources–Single loop generator; Single phase and three phase supply; Electrical circuit elements (R, L and C), Ohm's law, Kirchhoff's laws,Representation of sinusoidal waveforms, peak and RMS values, phasor representation, reactive power, apparent power, real power, energy and power factor.

UNIT-II: PRINCIPLES OF ELECTRICAL SYSTEMS-II (09 Periods)

Significance of Power factor and power factor correction,most economical power factor. Typical layout of electrical grid; Typical layout and operation of Hydro, Thermal and Solar Power Plants; Fuse, circuit breaker (MCB, MCCB, RCCB, ELCB), relay (elementary treatment);Inverter and UPS. Energy Efficiency (Star rating) standards by BEE.

UNIT-III: TRANSFORMERS AND MACHINES (10 Periods)

Construction and working of a single phase transformer, EMF Equation; Construction, working and applications of Permanent Magnet DC Motor, Brushless DC Motor, three phase induction motor; construction, working and applications of stepper motor, resistor start & capacitor start and run single phase induction motor.

UNIT-IV: SEMICONDUCTOR DEVICES (09 Periods)

PN Junction diode, Characteristics, applications - half wave and full wave rectifier. Zener diode, characteristics, application–Regulator.BJT-operation,configurations, characteristics.

UNIT-V: OP-AMPS (08 Periods)

Operational Amplifier: Block diagram of Op-Amp, equivalent circuit, Op-Amp AC and DC Characteristics, Inverting and Non-Inverting modes. Applications - Adder, Comparator, Integrator and Differentiator.

Total Periods: 45

Topics for Self-study are provided in the lesson plan.

TEXT BOOKS:

1. AshfaqHussain*, Fundamentals of Electrical Engineering,* Dhanpatrai& Co. (P) Ltd.,*3rd* Edition, New Delhi, 2009.
2. R. L. Boylestad and Louis Nashelsky, *Electronics Devices and Circuits*, PHI, 11thEdition, 2009.

REFERENCE BOOKS:

1. M.S. Naidu, S. Kamakshaiah, *Introduction to Electrical Engineering,*Tata McGraw-Hill Education, New Delhi, 2007.
2. D. Roy Chowdhury, *Linear Integrated Circuits*, New Age International Pvt. Ltd., 4thEdition, 2011.

I B. Tech. – II Semester

(20BT20541) PROGRAMMING IN C AND DATA STRUCTURES

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: ACourse on Basic Mathematics

COURSE DESCRIPTION: Algorithms; Flowcharts;Introduction to C language; Operators and expressions; Input and output functions; Control statements; Arrays; Strings; Functions; Pointers; User-defined data types;Linked lists; Overview of data structures; Stack; Queue; Searching algorithms; Sorting algorithms.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop flowcharts, algorithms for given problems.
CO2. Design algorithmic solutions by analyzing programming problems and using appropriate C language constructs.
CO3. Apply linear data structures such as arrays, linked lists, stacks, queues for efficient data organization and manipulation.
CO4. Select appropriate techniques for searching and sorting problems.

Mapping of COs with POs

Course Outcome	*PO1*	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*
CO1	3	2	-	-		-	-	-	-	-	-	-
CO2	3	3	3	-	-		-	-	-	-		-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
Average	2.75	2.75	3	2	-	-	-	-	-	-	-	-
Correlation level	3	3	3	2	-	-	-	-	-	-	-	-

Correlation Level: 3-High 2-Medium 1-Low

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO C PROGRAMMING (08 Periods)

***Introduction to Algorithms and Flowcharts*:** What is an algorithm, Different ways of stating algorithms, Key features of algorithm, What are variables, Subroutines,Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Basis of C Programming:Introduction, Structure of a C program, Concept of a variable, Data types in C, Program statement, Declaration, Howdoes the computer store data in memory, Tokens, Operators and expressions, Expressions revisited, Type conversion in C.

UNIT–II: INPUT AND OUTPUT, CONTROL STATEMENTS (09 Periods)

***Input and Output*:** Basic screen and keyboard I/O in C, Non-formatted input and output, Formatted input and output functions.

Control Statements: Specifying test condition for selection and iteration, Writing test expression, Conditional execution and selection, Iteration and repetitive execution, goto statement, Special control statements, Nested loops.

UNIT–III: ARRAYS AND STRINGS, FUNCTIONS (10 Periods)

***Arrays and Strings*:** One-dimensional array – Declaration, Initialization,Manipulation;Multi-dimensional arrays – Declaration, Initialization, Manipulation; Strings – Declaration, Initialization, String input/output, Character manipulation, String manipulation; Arrays of strings – Declaration, Initialization, Manipulation.

***Functions*:** Concept of function, Using functions, Call by value mechanism, Working with functions, Passing arrays to functions, Scope and extent, Storage classes, Recursion.

UNIT–IV: POINTERS, USER-DEFINED DATA TYPES, LINKED LISTS (10 Periods)

Pointers in C: Understanding memory addresses, Address operator (&), Pointer, Arrays and pointers, Pointers and strings, Pointer arithmetic, Pointers to pointers, Array of pointers, Pointers to an array, Two-dimensional arrays and pointers, Dynamic memory allocation.

User-Defined Data Types: Structures - Declaration, Initialization, Accessing members,Arrays of structures, Arrays within structure, Structures and pointers, Structures and functions; Enumeration types.

Linked Lists: Single linked lists – Definition, Representation, Operations, Inserting a node, Deleting a node; Applications of linked lists, Disadvantages of linked lists, Array versus linked list revisited.

UNIT– V: DATA STRUCTURES (08 Periods)

Basic Data Structures: Overview of data structures, Stack – Definition, Array representation, Implementation of stack operations using arrays; Queue - Definition, Array representation, Implementation of queue operations using array.

Searching and Sorting: Linear Search, Binary Search, Bubble sort, Selection sort.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Pradip Dey and Manas Ghosh, *Programming in C,*Oxford University Press, 2018.
2. DebasisSamanta, *Classic Data Structures,*2nd Edition, PHI Learning, 2009.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, *Programming with C*, 4thEdition, McGraw Hill Education, 2019.
2. YashavantKanetkar, *Let Us C,* 17thEdition, BPB Publications, 2020.

ADDITIONAL LEARNING RESOURCES:

1. E. Balagurusamy, *Programming in C*, 7thEdition, McGraw Hill, 2014.
2. R. G. Dromey, *How to Solve it by Computer*, Pearson Education, 2007.

3. https://nptel.ac.in/courses/106/104/106104128/
4. https://nptel.ac.in/courses/106/103/106103069/

I B. Tech. – II Semester
(20BT20101) CIVIL ENGINEERING MATERIALS AND CONCRETE TECHNOLOGY

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Engineering Chemistry

COURSE DESCRIPTION: Stones; Bricks; Tiles; Timber; Miscellaneous Materials in Construction; Cement, Admixtures and Aggregates; Fresh and Hardened Concrete; Elasticity, Shrinkage, Creep and Concrete Mix Design.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze stones, bricks and tiles using different tools and techniques for civil engineering construction considering codes of practice, safety, environment and sustainabilitybesides communicating effectively in graphical form.
CO2. Analyze timber and miscellaneous materials using different tools and techniques and through continuous learning for civil engineering construction considering codes of practice, environment and sustainabilitybesides communicating effectively in graphical form.
CO3. Analyze cement, admixtures and aggregates Using different tools and techniques for civil engineering construction considering codes of practice, environment and sustainabilitybesides communicating effectively in graphical form.
CO4. Analyze fresh and hardened concrete using different tools and techniques for civil engineering construction considering codes of practice, environment and sustainabilitybesides communicating effectively in graphical form.
CO5. Analyze elasticity, shrinkage and creep of concreteusing different tools and techniques for civil engineering construction considering codes of practice, environment and sustainability besides communicating effectively in graphical form.
CO6. Design a concrete mix using appropriate methods for solving complex concrete technology problems considering codes of practice, safety, environment and sustainability.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3			3	2	2	2		1			3		
CO2	4	2	3			3	2	2	2		1		2	3		
CO3	4	2	3			3	2	2	2		1			3		
C04	4	2	3			3	2	2	2		1			3		
C05	4	2	3			3	2	2	2		1			3		
C06	6	2	3	3	2	3	2	2	2					3		

Correlation Levels: 3: H – High 2: M – Medium 1: L – Low

DETAILED SYLLABUS:

UNIT – I: STONES, BRICKS AND TILES (09 Periods)

Stones: Properties of building stones and structural requirements, Classification of stones, Stone quarrying, Blasting and dressing of stones.

Bricks and Tiles: Composition of good brick earth, Manufacture of bricks, Qualities of a good brick, Efflorescence in bricks, Classification of bricks, Characteristics of good tile, Manufacturing methods, Types of tiles.

UNIT – II: TIMBER AND MISCELLANEOUS MATERIALS FOR CONSTRUCTION (08 Periods)

Timber: Structure, Properties, Seasoning of timber, Classification of various types of wood used in buildings, Defects in timber, Decay of timber, Mechanical treatment, Alternative materials for wood, Paints, Varnishes, Bituminous wooden products in construction.

Miscellaneous Materials For Construction:Use of Materials like galvanized iron, steel, aluminum, glass, bituminous materials, rubber, fiber–reinforced plastics, ceramic products, asbestos and their quality; Modern building materials; Building materials for low cost housing, Utilisation of waste for alternative building materials, Sustainable materials in construction.

UNIT – III: CEMENT, ADMIXTURES AND AGGREGATES (09 Periods)

Cement and Admixtures:Ingredients of cement, Manufacture of OPC, Types of cement and their properties, Grades of Cement, Various field and laboratory tests on cement, Admixtures - mineral admixtures, chemical admixtures.

Aggregates: Classification of aggregate, Physical properties, Mechanical properties, Bond strength, Bulking of sand, Deleterious substance in aggregate, Soundness of aggregate, Alkali aggregate reaction, Sieve analysis, Gradation, Maximum aggregate size.

UNIT - IV: FRESH AND HARDENED CONCRETE (09 Periods)

Fresh Concrete: Ingredients of cement concrete and their importance, Manufacture of concrete, Workability, Factors affecting, Measurement of workability, Setting times of concrete, Effect of time and temperature on workability, Segregation and bleeding, Ready mix concrete, Quality of mixing water.

Hardened Concrete: Water/Cement ratio, Abram's Law, Gel space ratio, Curing, Nature of strength of concrete, Maturity concept, Strength in tension and compression, Factors affecting strength, Tests on hardened concrete, Relation between compressive and tensile strength,Non-destructive testing methods – Rebound hammer, ultrasonic pulse velocity method, codal provisions.

UNIT – V: ELASTICITY, SHRINKAGE, CREEP AND CONCRETE MIX DESIGN (10 Periods)

***Elasticity, Shrinkage and Creep*:** Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Shrinkage – Types, factors; Creep of concrete - Factors, Relation between creep and time, Effects.

Concrete Mix Design:Factors in the choice of mix proportions, Durability of concrete, Quality control of concrete, Statistical methods, Acceptance criteria, Proportioning of concrete mixes by various methods – ACI method and IS 10262 method.

Total Periods: *45*

Topics for Self-study are provided in the lesson plan.

TEXT BOOKS:

1. S. K. Duggal, *Building Materials*, New Age International Publishers, 4th Edition, 2010.
2. M.S. Shetty, *Concrete Technology*, S. Chand and Company Ltd., 7th Edition, 2011.

REFERENCE BOOKS:

1. P.C. Varghese, *Building Materials*, Prentice-Hall of India Private Ltd., New Delhi, 2011.
2. A.M. Neville, *Properties of Concrete*, 5thEdition, John Wiley and Sons, New Delhi, 2012.

ADDITIONAL LEARNING RESOURCES:

1. M.L. Gambhir, *Concrete Technology*, 3rd Edition, Tata McGraw-Hill Publishers, New Delhi, 2008.
2. A.R. Santha Kumar, *Concrete Technology*, 7th Edition, Oxford University Press, New Delhi, 2011.

I B.Tech. - II Semester

(20BT1HS31)**COMMUNICATIVE ENGLISH LAB**

(Common to CE, ME, EEE, ECE, EIE, CSE(IOT) and CS&D)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE REQUISITE:-

COURSE DESCRIPTION: Just a Minute, Elocution/Impromptu; Phonetics; Vocabulary Building; Grammar; Giving Directions; Role Plays; Public Speaking; Letter Writing; Describing Objects; Listening Comprehension; Information Transfer and Reading Comprehension.

COURSE OUTCOMES: After successful completion of this course, students will be able to:

CO1. Demonstrate knowledge of Phonetics by examining and applying sounds of English through Phonetics.

CO2. Analyze sentence structures by applying and demonstrating knowledge of Vocabulary and Grammar.

CO3. Apply appropriate listening and reading skills by analyzing the context, and demonstrate through listening comprehension and reading comprehension.

CO4. Function effectively as an individual and as a member in diverse teams examining and applying speaking skills in Just A Minute and Role Play.

CO5. Communicate effectively applying appropriate writing and speaking techniques by examining and demonstrating knowledge through Describing Objects, Information Transfer and Letter Writing in formal and real time situations.

Mapping of COs with POs

	PO1	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***	***PO12***
CO1	2	-	-	-		-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	1	1	-	-	1	-	-	-	-	-	-	-
CO4	1	1	-	-	2	-	-	-	1	-	-	-
CO5	1	2	-	-	2	-	-	-	-	3	-	1
Average	1.5	1.75	-	-	1.67	-	-	-	-		-	
Correlation level	2	2	-		2	-	-	-	-	-	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

*** First Ten Exercises are mandatory among the following:**

List of Exercises:

1. **Just a Minute, Elocution/Impromptu**
   Steps to be followed – Useful tips – Dos & Don'ts – Preparation – Examples
2. **Phonetics**
   Sounds of English – Consonants – Vowels – Speech Organs – Phonetic Transcription – Word Accent – Basics of Intonation
3. **Vocabulary Building**
   Prefixes & Suffixes – Synonyms & Antonyms – Phrasal verbs – Idioms – One word substitutes – Words often confused
4. **Grammar**
   Tenses –Nouns – Word order and error correction
5. **Giving Directions**
   Useful phrases – Sample conversations - Exercises
6. **Role Plays**
   Useful tips – Dos & Don'ts – Exercises – Role Plays for practice
7. **Public Speaking**
   Stage presence – Voice control – Body Language – Rehearsals – Audience – Delivery - Dos & Don'ts – Project Submission
8. **Letter Writing**
   Introduction – Objective – Formats – Types – Exercises
9. **Describing Objects**
   Jargon – Useful Phrases – Do's & Don'ts – Exercises
10. **Listening Comprehension**
    Introduction – Types of listening – Practice – Benefits of listening – Exercises
11. **Information Transfer**
    Tables – Pie Charts – Venn Diagrams – Graphs – Flow Charts – Steps to be followed- Exercises
12. **Reading Comprehension**

Introduction – Types of reading – Inferring – Critical analysis – Exercises

TEXT BOOK:

1.Communicative English Lab, SVEC

REFERENCE BOOKS:

1. D. Sudha Rani, *A Manual for English Language Laboratories*, Pearson, Noida, 2010.
2. Nira Kumar, English *Language Laboratories*, PHI Learning Pvt. Ltd., New Delhi, 2011.

SUGGESTED SOFTWARES:

1. SoftX
2. Speech Solutions
3. English Pronunciation Dictionary by Daniel Jones
4. Learning to Speak English 8.1, The Learning Company – 4 CDs.
5. Mastering English: Grammar, Punctuation and Composition.
6. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
7. Dorling Kindersley Series of Grammar.
8. Language in Use 1, 2 & 3
9. Cambridge Advanced Learner's Dictionary - 3rd Edition
10. Centronix – Phonetics
11. Let's Talk English, Regional Institute of English South India.

ADDITIONAL LEARNING RESOURCES

1. https://goo.gl/IjE45p: Amazon India site – with thousands of different product descriptions
2. https://goo.gl/3ozeO6: 15 ways to calm your nerves before giving a presentation.
3. https://goo.gl/p20ttk: useful site for more language about introducing yourself.
4. https://goo.glsvMHZ1: information and advice about describing line graphs
5. https://goo.gl/NqFJuc: an informative presentation about using line graphs

I B. Tech. – II Semester

(20BT20551) PROGRAMMING IN C AND DATA STRUCTURES LAB

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: A course on "Programming in C and Data Structures"

COURSE DESCRIPTION: Hands on practice in developing and executing simple programs using C Programming constructs – Control statements, Arrays, Strings, Functions, Pointers, Structures, Single linked lists,Stack, Queue, Searching and Sorting.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design algorithmic solutions by analyzing programming problems and using appropriate C language constructs.

CO2. Implement linear data structures such as arrays, linked lists, stacks, queues for efficient data organization and manipulation.

CO3. Select appropriate techniques for searching and sorting problems.

CO4. Work independently and communicate effectively in oral and written forms.

Mapping of COs with POs

	PO1	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***	***PO12***
CO1	3	3	3	-		-	-	-	-	-	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-
CO3	2	3	3	2		-	-	-	-	-	-	-
CO4	1	1	-	-		-	-	-	-	-	-	-
CO5	1	2	-	-		-	-	-	3	3	-	-
Average	2.6	3	3	2		-	-	-	3	3	-	
Correlation level	**3**	**3**	**3**	**2**		-	-	-	**3**	**3**	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

LIST OF EXERCISES:

1. a) Let a and b are two integer variables whose values are 10 and 13 respectively. Write a program to evaluate the following arithmetic expressions.
   i) a + b ii) a–b iii) a * b iv) a/b v) a % b

b) Write a program to evaluate the following algebraic expressions after reading necessary values from keyword.

i) $(ax + b)/(ax - b)$

ii) $2.5 \log x + \text{Cos } 32^0 + | x^2 + y^2 |$

iii) $x^5 + 10\, x^4 + 8$ and $x^3 + 4\, x + 2$

iv) ae^{kt}

2. a) Mr. Gupta deposited Rs.1000 in a bank. The bank gives simple interest at the rate of 15% per annum. Write a program to determine the amount in Mr. Gupta's account at the end of 5 years. (Use the formula I = PTR / 100)

b) A cashier has currency notes of denominations Rs.10, Rs. 50 and Rs. 100. If the amount to be withdrawn is input in hundreds, find the total number of notes of each denomination the cashier will have to give to the withdrawer.

c) In a town, the percentage of men is 52. The percentage of total literacy is 48. If total percentage of literate men is 35 of the total population; write a program to find the total number of illiterate men and women if the population of the town is 8000.

3. a) Write a program that prints the given three integers in ascending order using if-else.

b) Write a program to calculate commission for the input value of sales amount. Commission is calculated as per the following rules:

i) Commission is NIL for sales amount Rs. 5000.

ii) Commission is 2% for sales when sales amount is >Rs. 5000 and <= Rs. 10000.

iii) Commission is 5% for sales amount >Rs. 10000.

c) If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit or loss he incurred in percentage.

4. a) An insurance company calculates premium as follows:

i) If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lakhs.

ii) If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs.1 lakh.

iii) If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000.

iv) In all other cases the person is not insured.

Write a program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

b) Write a program, which takes two integer operands and one operator as input from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, %. Use switch statement)

5. a) Write a program to find the sum of individual digits of a positive integer.

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

6. a) Write a program to find the largest and smallest number in a given list of integers.

   b) Write a program to perform addition of two matrices.

   c) Write a program to determine whether the given string is palindrome or not.

7. a) Write a program using functions to perform the following operations:
      i) To convert a given decimal number into binary number
      ii) To convert a given binary number into decimal number

   b) Write a program using functions insert a sub-string in main string at a specified position.

8. a) Write a C program to print the elements of an array in reverse order using pointers.

   b) Write a program to accept the elements of the structure as: Employee-name, Basic pay. Display the same structure along with the DA, CCA and Gross salary for 5 employees.

      Note: DA=51% of Basic pay, CCA=Rs.100consolidated.

9. A college has N number of students and the following details of all the students are maintained – register number, name, branch, phone number. Write a program to store the details of the students using a singly linked list. Develop functions to perform the following operations on the data.
      i) Insert new student's details
      ii) Display the details of the students
      iii) Delete a given student's information

10 a) Develop a menu driven program to perform the following operations on a stack of integers (Array implementation of stack with maximum size MAX)
      i) Push an element
      ii) Pop an element
      iii) Display the status
      iv) Demonstrate overflow and underflow situations

   b) Develop a menu driven program to perform the following operations on a queue of characters (Array implementation of queue with maximum size MAX).
      i) Insert an element
      ii) Delete an element
      iii) Display the status
      iv) Demonstrate overflow and underflow situations

11 Store register numbers of students who attended placement training program in a random order in an array. Write a function to search whether a student

has attended placement training program or not using

a) Linear Search

b) Binary Search

12 Given marks of N number of students in mathematics subject, write a program to display the marks of students in ascending order using

a) Bubble Sort

b) Selection Sort

TEXT BOOKS:

1. Pradip Dey and Manas Ghosh, *Programming in C,* Oxford University Press, 2018.
2. DebasisSamanta, *Classic Data Structures,* 2nd Edition, PHI Learning, 2009.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, *Programming with C*, 4th Edition, McGraw Hill Education, 2019.
2. YashavantKanetkar, *Let Us C,* 17thEdition, BPB Publications, 2020.

I B. Tech. – II Semester

(20BT20131) **ENGINEERING GEOLOGY LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: -

COURSE DESCRIPTION: Study of physical properties and identification of minerals and rocks; Rock forming minerals; Ore forming minerals; Igneous rocks; Sedimentary rocks; Metamorphic rocks; Geological maps; Problems on structural geology; Geophysical studies;Measurement of groundwater level.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Identify minerals and rocks using appropriate tools and techniques in order to understand the impact of geological features on civil engineering projects considering standard protocols.

CO2. Analyze structural geology problems for feasible inferences associated with civil engineering projects.

CO3. Develop and interpret geological sections from the geological maps for the benefit of civil engineering projects.

CO4. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on geological information.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2	2			2						3	
CO2	4	1	3												3	
CO3	6	1	2	3	3										3	
CO4	4									3	3				-	
Average		1.67	2.67	3	2.5	2			2	3	3				3	
Correlation level		2	3	3	3	2			2	3	3				3	

Correlation Levels: 1: H – High 2: M – Medium 3: L - Low

LIST OF PRACTICAL EXERCISES:

A) MINERALS

1. Study of physical properties and identification of rock forming minerals
2. Study of physical properties and identification of ore forming minerals

B) ROCKS

3. Study of physical properties and identification of common igneous rocks
4. Study of physical properties and identification of common sedimentary rocks
5. Study of physical properties and identification of common metamorphic rocks

C) STRUCTURAL GEOLOGY PROBLEMS

6. Thickness
7. Strike and dip

8. Bore hole

D) GEOLOGICAL MAPS

9. Study of geological maps, drawing and interpretation of geological sections in horizontal beds
10. Study of geological maps, drawing and interpretation of geological sections in vertical beds
11. Study of geological maps, drawing and interpretation of geological sections in beds with fault plane
12. Study of geological maps, drawing and interpretation of geological sections in beds with folding

E) GEOPHYSICAL STUDIES

13. Electrical resistivity survey (not for the examination)
14. Seismic surveys (not for the examination)

F) MEASUREMENT OF GROUNDWATER LEVEL

15. Measurement of groundwater level using water level meter (not for the examination)

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Engineering Geology Laboratory Manual (SVEC20 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

I B. Tech. - II Semester

(20BT1MC01) **UNIVERSAL HUMAN VALUES**

(Mandatory Course)

(Common to CE, ME, EEE, ECE, EIE, CSE(IOT) and CS&D)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	-	30	2	-	-	-

PRE-REQUISITES:-

COURSE DESCRIPTION: Value education; Human being and self; Family, the society and the nations; Harmony with the nature and Harmony with professional ethics.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand Values and skills for sustained happiness and prosperity.
CO2. Analyse realistic implications of a Holistic understanding of ethical human conduct, trustful and mutually fulfilling human behaviour.
CO3. Apply holistic approach in personal life and profession through a positive understanding of the Human reality and existence.

Mapping of COs with POs

Course Outcome	**Program Outcomes**			
	PO1	**PO6**	**PO7**	**PO8**
CO1	2	3	2	-
CO2	3	3	3	-
CO3	3	3	3	2
Average	2.67	3.0	2.67	2.0
Correlationlevel	3	3	3	2

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT - I: VALUE EDUCATION (06 Periods)

Human Values-Introduction; Self-Exploration - Natural Acceptance; Human Aspirations-Right understanding- the current scenario: understanding and living in harmony.

UNIT - II: HUMAN BEING AND SELF (06 Periods)

Understanding human being - I' and the material 'Body'; needs of Self ('I') and 'Body'-happiness and physical facility; Body as an instrument of 'I' - characteristics and activities of 'I' and harmony in 'I'; harmony of I with the Body.

UNIT - III: FAMILY, THE SOCIETY AND THE NATIONS (06 Periods)

Values in human relationship (nine universal values)- foundational values of relationship; Difference between intention and competence; Difference between respect and differentiation; harmony in the society; Universal harmonious order in society.

UNIT - IV: HARMONY WITH THE NATURE (06 Periods)

Harmony in the Nature; Interconnectedness and mutual fulfilment - the four orders of nature-Recyclability and Self-regulation; Existence as Co-existence;Holistic perception of harmony and existence.

UNIT - V: HARMONY WITH PROFESSIONALETHICS (06 Periods)

Acceptance of human values; Ethical Human Conduct; Basis for Humanistic Education; Competence in professional ethics; Case studies: Holistic technologies, Management Models and Production Systems; Socially and ecologically responsible engineers, technologists and managers - enriching institutions and organizations.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,Excel Books,New Delhi, 2010

REFERENCE BOOKS:

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

II B. Tech. - I Semester

(20BT3BS01) NUMERICAL METHODS, PROBABILITY AND STATISTICS

(Common to CSE, CSSE, IT, CSE(AI), CSE(DS), CSBS, ME and CE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITE:-

COURSE DESCRIPTION: Numerical solutions of equations and interpolation; Numerical differentiation and integration; Random variables and mathematical expectations; Probability distributions; Test of hypothesis.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Provide solutions forequations, derivatives and integrals through numerical methods for thegiven data.

CO2. Identify the types of random variables and determine their probabilities & mathematical expectation.

CO3. Apply the concept of probability distributions to solve engineering problems.

CO4. Analyze the hypothesis by applying statistical testing methods.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	-	-	-	-	-	-	-			
CO2	3	2	-	-	-	-	-	-	-	-	-	-			
CO3	3	2	-	-	1	-	-	-	-	-	-	-			
CO4	2	3	-	1	1	-	-	-	-	-	-	-			
Average	2.75	2.25	-	1	1	-	-	-	-	-	-	-			
Correlation level	3	3	-	1	1	-	-	-	-	-	-	-			

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT-I: NUMERICAL SOLUTIONS OF EQUATIONS AND INTERPOLATION (08 periods)

Solutions of algebraic and transcendental equations: Regula-falsi method, Newton-Raphson method; Interpolation: Forward and backward differences, interpolation using Newton's forward and backward difference formulae, Lagrange's interpolation formula, partial fractions using Lagrange's interpolation formula.

UNIT-II: NUMERICAL DIFFERENTIATION AND INTEGRATION (09 Periods)

Numerical differentiation using Newton's forward and backward interpolation formulae; Numerical integration using Simpson's $1/3^{rd}$ and $3/8^{th}$ rules; Numerical solutions of first

order ordinary differential equations by Taylor's series and fourth order Runge-Kutta methods.

UNIT-III: RANDOM VARIABLES AND MATHEMATICAL EXPECTATION

(08 Periods)

Random Variables: Discrete and continuous random variables, distribution function of random variables, properties, probability mass function, probability density function; mathematical expectation, properties of mathematical expectation, mean and variance.

UNIT-IV: PROBABILITY DISTRIBUTIONS **(09 Periods)**

Discrete probability distributions: Binomial and Poisson distributions - mean, variance, standard deviation (derivations are not required); Continuous probability distributions: Normal, uniform and exponential distributions- mean, variance, standard deviation (derivations are not required), area under the normal curve.

UNIT-V: TEST OF HYPOTHESIS **(11 Periods)**

Population and sample, parameter and statistic, null and alternative hypothesis, Type I and Type II errors, level of Significance, critical region, degrees of freedom; Large sample test: Tests of significance for proportions and means; Small sample test: Student's t-test- single mean, difference of means, F-test for equality of population variances, Chi-Square test for independence of attributes.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S. N. Prasad, *Mathematical Methods,* S. Chand & Company, 8th edition, 2013.
2. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham and M. V. S. S. N. Prasad, *Probabilityand Statistics,* S. Chand & Company, 5th edition, 2016.

REFERENCE BOOKS:

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 44th edition, 2017.
2. P. Kandasamy, K. Thilagavathy and K. Gunavathi, *Numerical Methods*, S. Chand and Company, 2nd edition, Reprint 2012.
3. S. C. Gupta and V. K. Kapoor, *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons Publications, 11th edition, 2012.

e-Resources:

1. https://nptel.ac.in/courses/111/107/111107105/ (Numerical Methods)
2. https://perhuaman.files.wordpress.com/2014/07/metodos-numericos.pdf (Numerical Methods)
3. https://nptel.ac.in/courses/111/105/111105090/ (Probability and Statistics)
4. https://nptel.ac.in/courses/111/105/111105041/ (Probability and Statistics)
5. https://www.vfu.bg/en/e-Learning/Math--Soong_Fundamentals_of_probability_and_statistics_for_engineers.pdf (Probability and Statistics)

II B. Tech. – I Semester
(20BT30101)CONSTRUCTION, PLANNING AND PROJECT MANAGEMENT

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course onCivil Engineering Materials and Concrete Technology

COURSE DESCRIPTION: Masonry and Foundations; Building Components; Finishings; Shoring; Scaffolding; Form Work; Organization and Resource Management; Project Management; Network Development; PERT and CPM.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Characterize masonry, foundations and building components using various tools and techniques besides communicating effectively in graphical form.
CO2. Analyze finishings, shoring, scaffolding and form work using various tools and techniques and through continuous learning considering safety, environment and sustainability.
CO3. Analyze organization and resource management through various tools and techniques in accordance with legislative laws and amendments in construction practice ensuring safety and sustainability.
CO4. Develop charts and event networks using appropriate tools and techniques for solving complex construction project management problems besides communicating effectively in graphical form.
CO5. Develop event networks for analyzing critical path by using CPM and PERT techniques and interpret various parameters for effective project management besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3			2					1			3		
CO2	4	2	3			3	2	2					2	3		
CO3	4	1	3			2	2	2	2			3		3		
C04	6	2	3	3	2	2					1	3		3		
C05	6	2	2	3	2	2					1	3		3		
Average		1.80	2.80	3	2	2.20	2	2	2		1	3	2	3		
Course Correlation Level		2	3	3	2	3	2	2	2		1	3	2	3		

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS

UNIT – I: MASONRY, FOUNDATIONSANDBUILDING COMPONENTS

(08 Periods)

Masonry and Foundations:Types of masonry, English and Flemish bonds, Rubble and ashlar masonry, Cavity walls, Partition walls, Foundations, Shallow foundations, Spread, Combined, Strap and mat footings.

Building Components:Lintels, Arches, Vaults, Stair cases, Different types of floors, Concrete, Mosaic, Terrazzo floors, Pitched, Flat and curved roofs, Lean–to–Roof, Coupled roofs, Trussed roofs, King and Queen post trusses, RCC Roofs, Madras Terrace/Shell Roofs.

UNIT - II: FINISHINGS, SHORING, SCAFFOLDING AND FORM WORK

(07 Periods)

Finishings: Damp proofing , Water proofing, Termite proofing, Fire proof materials used, Plastering, Pointing, White washing and distempering, Painting, Constituents of a paint, Types of paints, Painting of new/old wood, Varnish.

Shoring, Scaffolding and Form Work:Types, Erection methodology, Latest equipment, Safety precautions.

UNIT - III: ORGANIZATION AND RESOURCE MANAGEMENT (10 Periods)

Organization:Types, Merits and demerits of different types of organization, Labour legislation in India, Workmen's compensation act of 1923 and minimum wages act of 1948, and subsequent amendments, Safety in construction.

Resource Management:Manpower: Resource smoothing, Resource leveling, establishing workers productivity.***Materials:*** Objectives of material management, Costs, Functions of material management departments, ABC classification of materials, Inventory of materials, Material procurement, Stores management. ***Machinery:*** (Basics only) Classification of construction equipment, Earth moving Equipment, Excavation equipment, Hauling equipment, Earth compaction equipment, Hoisting equipment, Concreting plant and equipment, Selection of equipment, Task consideration, Cost consideration, Factors affecting the selection, Factors affecting cost owning and operating the equipment, Equipment maintenance.

UNIT - IV: PROJECT MANAGEMENTAND NETWORKDEVELOPMENT

(11 Periods)

Project Management:Project planning, Scheduling, Controlling, Role of decision in project management, Techniques for analyzing alternatives,Operation research, Methods of planning and programming problems, Development of bar chart- Illustrative examples, Shortcomings of bar charts and remedial measures; Milestone charts, Development of PERT network problems.

Network Development:Introduction, Event, Activity, Dummy, Graphical guidelines for network, Common partial situations in network, Numbering the events, Cycles problems, Planning for network construction, Modes of network construction, Steps in development ofnetwork, Work breakdown structure, Hierarchies, Illustrativeexamples.

UNIT – V: PERT AND CPM (09 Periods)

Network analyses, PERT, Slack, Critical path, Illustrative examples, Probability of meeting scheduled date problems, CPM process, CPM networks, Activity time estimate, Earliest event time, Latest allowable occurrence time, Combined tabular computations for T_E and T_L, Start and finish times of activity, Float, Critical activities and critical path, Resource allocation, leveling, Crashing, Illustrative examples.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Chitkara, K. K.,*Construction Project Management*,Tata McGraw Hill Education Pvt. Ltd., 4thEdition, 2019.
2. Punmia, B.C. and Khandelwal, K.K.,*Project Planning and Control withPERT and CPM,*Lakshmi Publications (P). Ltd., 5thEdition, 2016.

REFERENCE BOOKS:

1. Neeraj Kumar Jha, *Construction Project Management,* Pearson Publications, 2nd Edition, 2015.
2. Chudly, R., *Construction Technology –Vol. I, II, III, IV,* Pearson India Education, 2ndEdition, 2014.
3. Seetharaman, S., *Construction Engineering and Management,* UmeshPublications, 5thEdition, 2017.
4. Punmia, B. C., Jain, Ashok Kumar and Jain, Arun Kumar,*Building Construction,* Laxmi Publications (P) Ltd., 11thEdition, 2016.

ADDITIONAL LEARNING RESOURCES:

1. Srinath, L. S., *PERT and CPM –Principles and Applications*, Affiliated East- West Press Pvt. Ltd., New Delhi, 3rd Edition,2001.
2. Hendrickson, C. and Au, T., *Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders*, Prentice Hall, Pitsburgh, Version 2.2, 2008.

II B. Tech. – I Semester

(20BT30102)**FLUID MECHANICS AND HYDRAULIC MACHINERY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	--	3

PRE-REQUISITES: Courses onEngineering Mechanics, Differential Equations and multi–variable calculus.

COURSE DESCRIPTION: Fluid properties and fluid statics; Fluid kinematics and fluid dynamics; Closed conduit flow and hydraulic similitude; Open channel flow; Turbines and pumps.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze fluid properties and fluid statics to solve complex problems using appropriate tools and techniques considering stability besides communicating effectively in graphical form.

CO2. Analyze fluid kinematics and dynamics to solve complex fluid flow problemsusing appropriate tools and techniques besides communicating effectively in graphical form.

CO3. Design pipes and piping systems to solve complex conduit flow problems using appropriate tools and techniques following latest developments besides communicating effectively in graphical form.

CO4. Analyze problems associated with hydraulic similitude and model studies to solve complex fluid mechanics problems using appropriate techniques besides communicating effectively in graphical form.

CO5. Design open channels to solve complex problemsusing appropriate tools and techniques considering safetyand environment besides communicating effectively in graphical form.

CO6. Design turbines and pumps to solve complex hydraulic engineering problems using appropriate tools and techniques considering safety and environment besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3	-	1	1	-	-	-	-	1	-	-	-	-	3
CO2	4	2	3	-	1	1	-	-	-	-	1	-	-	-	-	3
CO3	6	1	2	3	2	1	-	-	-	-	1	-	1	-	-	3
CO4	4	2	3	-	2	1	-	-	-	-	1	-	-	-	-	3
CO5	6	1	2	3	2	1	1	1	-	-	1	-	-	-	-	3
CO6	6	1	2	3	2	1	1	1	-	-	1	-	-	-	-	3
Average		1.50	2.50	3.00	1.67	1.00	1.00	1.00	-	-	1.00	-	1.00	-	-	3.00
Course Correlation Level		2	3	3	2	1	1	1	-	-	1	-	1	-	-	3

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: FLUID PROPERTIES AND FLUID STATICS (09 Periods)

Dimensions and units, Physical properties of fluids, Pressure at a point, Pascal's law,Hydrostatic law; Atmospheric, gauge and absolute pressures; Measurement of pressure, Manometers, Hydrostatic forces on submerged plane and curved surfaces – Centre ofpressure on plane and curved surfaces, Buoyancy, Centre of Buoyancy, Stability of floating bodies.

UNIT-II:FLUID KINEMATICS AND DYNAMICS (08 Periods)

***Fluid Kinematics*:** Description of fluid flow, Stream line, Path line and streak line, Streamtube, Classification of flows, Equation of continuity, Stream and velocity potential functions,Flownet and its uses.

***Fluid Dynamics*:** Surface and body forces, Euler's Equation, Bernoulli's equation for flow along a stream line and its applications, Vortex flows, Momentum equation and its application, Forces on pipe bend, Moment of momentum equation and its application, Torque on sprinklers.

UNIT- III:CLOSED CONDUIT FLOW AND HYDRAULIC SIMILITUDE (09 Periods)

***Closed Conduit Flow*:** Laws of fluid friction, Major loss, Darcy–Weisbach equation, Minor losses, Pipes in series, Pipes in parallel, Total energy line and hydraulic gradient line, Venturimeter, Orificemeter, Pitot tube, Orifices and mouthpieces, Notches and weirs, Latest flow measuring devices.

***Hydraulic Similitude*:**Dimensional analysis, Rayleigh's method and Buckingham's pi theorem, Model studies, Similarities - Geometric, kinematic and dynamic similarities; Dimensionless numbers, Model laws, Types of model, Distorted and undistorted model, Resistance on floating and submerged bodies.

UNIT- IV: OPEN CHANNEL FLOW (09 Periods)

Types of flows, Types of channels, Velocity distribution, Chezy's, Manning's and Bazin's formulae for uniform flow, Most Economical sections, Critical flow, Specific Energy, Critical depth, Computation of critical depth, Critical, subcritical and supercritical flows, Non-uniform flow, Dynamic equation for gradually varied flow, Types of slopes, Surface profiles, Rapidly varied flow, Hydraulic jump and its applications, Surges.

UNIT- V: TURBINES AND PUMPS (10 Periods)

***Turbines*:**Jet on plane and curved surfaces, Classification of turbines, Pelton wheel, Francis turbine, Kaplan turbine, Working proportions, Velocity diagrams, Work done and efficiency, Hydraulic design, Runaway speed, Draft tube theory, Function and efficiency, Governing of turbines, Surge tanks, Unit quantities and specific speed, Performance of turbines, Characteristic curves, Cavitation, Causes, Effects.

***Pumps*:**Pumps-Components, Classification; Centrifugal pumps-Classification, Heads, Losses and efficiencies, Limitation of suction lift, Work done, Minimum starting speed, Specific speed; Multistage pumps, Pumps in parallel and series, Performance of pumps, Characteristic curves, Net positive suction head, Priming, Cavitation.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Rajput, R. K., *A Textbook of Fluid Mechanics and Hydraulic Machines*, S. Chand Publishers, 6th Edition, 2016.
2. Bansal, R. K., *Fluid Mechanics and Hydraulic Machines*, Laxmi Publishers, 9th Edition, 2011.

REFERENCE BOOKS:

1. Modi, P. N. and SethS. M., *Hydraulics and Fluid Mechanics Including Hydraulic Machines*, Standard Book House, 20th Edition, 2011.
2. Douglas, J. F., Gaserek, J.M. and Swaffirld, J.A., *Fluid Mechanics*, Longman, 5th Edition, 2010.
3. Cimbala, J. M. and Cengel, Y. A., *Fluid Mechanics: Fundamentals and Applications*, Tata McGraw–Hill Publishers Pvt. Ltd, 2019.
4. Khurmi, R. S., *Hydraulics, Fluid Mechanics and Hydraulic Machines*, S. Chand Publishing, 2014.

ADDITIONAL LEARNING RESOURCES:

1. Som, S. K. and Biswas, G., *Introduction to Fluid Machines*, Tata McGraw–Hill Publishers Pvt. Ltd, 2nd Edition, 2010.
2. Domkundwar and Domkundwar, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Dhanpat Rai and Co, 6th Edition, 2014.
3. Streeter, V. L., Wylie, E. B. and Bedford, K. W., *Fluid Mechanics*, McGraw Hill Book Company, 9th Edition, Indian Edition, 2017.

II B.Tech. – I Semester

(20BT30103) **MECHANICS OF SOLIDS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course onEngineering Mechanics

COURSE DESCRIPTION: Shear force and bending moment; Stresses in beams; Combined direct and bending stresses; Torsion; Springs; Principalstresses and strains; Theories of failures; Columns and struts.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze shear force and bending moment distributions for determinate beams with different loadings to solve complex structural analysis problems besides communicating effectively in graphical form.
CO2. Design beams considering bending stresses, shear stress, strain energyand theories of failurestosolve complex problems ensuring safety besides communicating effectively in graphical form.
CO3. Analyze direct and bending stresses for columns and chimneys ensuring safety besides communicating effectively in graphical form.
CO4. Design shafts and springs tosolve complex problems ensuring safety.
CO5. Analyze principal stresses and strains for bars and beams ensuring safety besides communicating effectively in graphical form.
CO6. Analyze columns and struts for critical loads using appropriate methods ensuring safety.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		3						3			3		
CO2	6	2	3	3	3		3				2			3		
CO3	4	2	3				3				2			3		
CO4	6	2	3	3	3		3							3		
CO5	4	2	3				3				2			3		
CO6	4	2	3			3	3							3		
Average		2	3	3	3	3	3				2			3		
Course Correlation Level		2	3	3	3	3	3				2			3		

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: SHEAR FORCE AND BENDING MOMENT (09 Periods)

Types of beams, Supports andloads, Concept of shear force and bending moment, SF and BM diagrams - Cantilever, Simply supported, Overhanging beams subjected to point loads, Uniformly distributed load, Uniformly varying load and its combination, Point of contraflexure, Relation betweenSF and BM, Rate of loading at a section of beam.

UNIT–II: STRESSES IN BEAMS, DIRECT AND BENDING STRESSES (09 Periods)

Stresses in Beams: Theory of simple bending, Basic bendingequation, Neutral axis, Bending stresses, Section modulus of different cross sections, Design of simple beam sections, Strain energy due to bending, Basic shear stress equation, Shear stress distribution for different cross sections, Strain energy due to shear.

***Direct and Bending Stresses*:**Stresses under the combined action of direct loading and bending moment, Core of a section, Stresses in chimneys, Conditions for stability, Stresses due to direct loading and bending moment about both axes.

UNIT – III: TORSION AND SPRINGS (09 Periods)

***Torsion*:** Theory of pure torsion, Torsional equation, Torsional moment of resistance, Polar section modulus, Power transmitted by shafts;combined bending, torsion and end thrust; Design of shafts.

***Springs*:** Deflection of close and open coiled helical springs under axial load and axial twist, Springs in series and parallel.

UNIT – IV:PRINCIPAL STRESSES AND STRAINS& THEORIES OF FAILURE (10 Periods)

Principal Stresses and Strains: Stresses on an inclined planeunder axial loading, Compound stresses, Normal and tangential stresses on an inclined plane for biaxial stresses, Two perpendicular normal stresses accompanied by a state of simple shear, Mohr's circle of stresses,Triaxial state of stresses, Principal stresses and strains.

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

UNIT – V: COLUMNS AND STRUTS (08Periods)

Short, medium and longcolumns, Axially loaded compression members, Euler's theorem for long columns, Euler's critical load, Equivalent length of a column, Slenderness ratio, Limitations of Euler's theory, Rankine–Gordon formula, Long columns subjected to eccentric loading.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *Mechanics of Materials*, Laxmi Publications Pvt. Ltd.,2005.
2. Bhavikatti, S. S., *Strength of Materials*, Vikas Publishing House, 4th Edition, 2013.

REFERENCE BOOKS:

1. Rajput, R.K., *Strength of Materials(Mechanics of Solids),* S. Chand & Company LTD, 6th Edition, 2015.
2. Basu, A. R., *Strength of Materials,* Dhanpat Rai & Co. (P) Ltd., 3rd Revised Edition, 2017.

3. Junnarkar, S. B. and Shah, H. J., Mechanics of Structures– Vol. I (Strength of Materials), Charotar Publishing House Pvt. Ltd.,32nd Revised and Enlarged Edition, 2016.
4. Khurmi, R. S., Strength of Materials, S. Chand & Company Ltd.,23rd Edition, 2005.

ADDITIONAL LEARNING RESOURCES:

1. T. D. Gunneswara Rao and Mudimby Andal, *"Strength of Materials: Fundamentals and Applications*, Cambridge University Press, 1st Edition, 2018.
2. Bansal, R. L., *Strength of Materials*, Laxmi Publications (P) Ltd., 6th Revised Edition, 2018.
3. Stephen H. Crandall, Norman C. Dahi, Thomas J. Lardner and Sivakumar M. S., *An Introduction to the Mechanics of Solids*, Tata McGraw-Hill Education Pvt. Ltd., 2nd Revised Edition, 2012.
4. S. Timoshenko.,*Strength of Materials*, CBS Publishers & Distributors Pvt. Ltd., Revised 3rd Edition, Special Indian Edition, 2004.
5. Ryder, G. H., *Strength of Materials,* Macmillan Publishers India Limited, 3rd Edition, Special Indian Edition, 2002.
6. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, Dhanpat Rai Publishing Co. Ltd., 9th Edition, 2014.

II B.Tech. – I Semester

(20BT30104)**SURVEYING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Numerical Methods, Probability and Statistics; Applied Physics.

COURSE DESCRIPTION: Chain surveying; Compass surveying; Plane tabling; Levelling and contouring; Theodolite surveying; Tacheometric surveying; Computation of areas and volumes; Curves; Electronic distance measurement; Drone surveying.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze chain, compass and plane table surveying techniques for measuring distances, horizontal angles and preparing plans to solve complex surveying problems following ethics and considering society, environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze leveling and contouring techniques for finding elevationsto solve complex surveying problems following ethics and considering societybesides communicating effectively in graphical form.

CO3. Analyze theodolite and tacheometric surveying techniques for finding distances, angles and elevations to solve complex surveying problems following ethicsand considering societybesides communicating effectively in graphical form.

CO4. Compute areas and volumes to solve complex surveying problems associated with civil engineering applications using appropriate techniques following ethics and considering societybesides communicating effectively in graphical form.

CO5. Design different types of curves to solve transportation engineering problems using appropriate techniques following ethics and considering society besides communicating effectively in graphical form.

CO6. Analyze EDM and drone surveying techniques for various applications following ethics and latest developments considering societybesides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2	2	2	1	1		2					3
CO2	4	3	3		2	2	2		2		1					3
CO3	4	3	3		2	2	2		2		1					3
CO4	4	3	3		2	2	2		2		2					3
CO5	6	3	2	3	3	2	2		2		2					3
CO6	4	3	3			2	2		2		2		2			3
Course Correlation value		3.00	2.83	3.00	2.20	2.00	2.00	1.00	1.83		1.67		2.00			3.00
Average		3	3	3	3	2	2	1	2		2		2			3

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT - I: CHAIN AND COMPASS SURVEYING (10 Periods)

Chain Surveying:Classification of surveying, Objectives,Principles of surveying; Influence of surveying on society, environment and sustainability; Distance measurement, Accuracy anderrors, Chain and its types, Optical square, Cross staff,Reconnaissance and site location,Locating ground featuresby offsets, Field book, Chaining for outline of structures, Methodsfor overcoming obstacles, Conventional symbols, Plotting chainsurvey, Computation of areas, Errors in chain surveying andtheir elimination.

Compass Surveying:Types of compass, Bearings, Includedangles, Errors and adjustments.

UNIT - II: PLANE TABLE SURVEYING, LEVELING ANDCONTOURING (09 Periods)

Plane Table Surveying:Equipment, Methods of plane tabling,Errors, Two and three point problems.

Leveling and Contouring:Types of leveling, Types of levelinginstruments, Temporary and permanent adjustments, Height of instrument and rise and fall methods, Plotting longitudinalsections and cross sections, Effect of curvature and refraction,Characteristics of contours, Uses of contour maps.

UNIT - III: THEODOLITE AND TACHEOMETRIC SURVEYING (08 Periods)

Theodolite Surveying:Description of theodolite, Temporaryand permanent adjustments of vernier transit, Measurement ofhorizontal and vertical angles, Heights and distances, Traversing,Closing error and distribution, Gale's traverse table, Omittedmeasurements.

Tacheometric Surveying:Principle of stadia method, Distanceand elevation formulae for staff held vertical and normal,Instrumental constants, Anallactic lens, Tangential method.

UNIT - IV: COMPUTATION OF AREAS AND VOLUMES, AND CURVES (09 Periods)

Computation of Areas:Areas dividing into number of triangles,By offsets to a base line, By coordinates, Areas from maps.

Computation of Volumes:Volume from cross-section,Embankments and cutting for a level section and two levelsections with and without transverse slopes, Determination ofthe capacity of reservoir.

Curves:Different types and their characteristics, Setting out,Design of curves by Rankine's and offset methods - Circular, Transition, Combined and vertical curve.

UNIT - V: ELECTRONIC DISTANCE MEASUREMENT (EDM) AND DRONESURVEYING (09 Periods)

EDM:EDM Principle, Modern electronic surveying equipment – Digitallevels, Digital theodolites, Total station; Total station – Workingprinciple, Applications: Measurement of distance, Area, Height,Angles, Gradients, Traversing, Contouring, Stake out, Data analysis; Latest developments in EDM survey techniques.

Drone Surveying:Working principle, Benefits of drones in surveying, Applications, Interior and exterior drone surveying, Calculation of length, area and stockpile volume.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain,*Surveying – Vol. I, II and III*, Laxmi Publications (P)Ltd., 17th Edition, 2016.
2. Subramanian, R., *Surveying and Levelling,* OxfordUniversity Press, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Duggal, S. K., *Surveying – Vol. I and II*, Tata McGraw–Hill Publishing Co. Ltd., 5th Edition, 2019.
2. Benton, A. R. and Taetz, P. J.,*Elements of PlaneSurveying,* McGraw-Hill, 3rd Edition, 2010.
3. Arora, K. R., *Surveying – Vol. I and II,* Standard BookHouse, 15th Edition, 2018.
4. Kanetkar, T. P. and Kulakarni, S. V., *Surveying and Leveling*,Pune VidyarthiGrihaPrakashan, Pune, 24th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Venkatramaiah, C., *Textbook of Surveying*, Universities Press (India) Limited, Hyderabad, 2ndEdition, 2011.
2. Nathanson, J. A, Lanzafama, M. T. and Kissam, P.,*Surveying Fundamentals and Practices*, Pearson Publications, 7th Edition, 2017.

II B.Tech. – I Semester

(20BT30131) CIVIL ENGINEERING MATERIALS AND CONSTRUCTION TECHNOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Course on Civil Engineering Materials and Concrete Technology.

COURSE DESCRIPTION: Experiments/Exercises on Civil Engineering Materials, Bricks, Timber, Tiles, Construction Equipment, Masonry, Bar Bending, Reinforcement, Painting, House wiring, Shuttering and Scaffolding.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluate civil engineering materialsusing various tools and techniques to solve complex civil engineering material problemsby following relevant IS codes and latest developments ensuring cost effectiveness, safety, environment and sustainability.

CO2. Analyzeconstruction techniquesto solve complex construction technology problemsby following current developments ensuring cost effectiveness, resource management, safety, environment and sustainability.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on civil engineering materials and construction technology.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	2	3		2	3	2	2	1			1	1	3		
CO2	4	2	3		2	3	1	2				2	2	3		
CO3	4									3	3			3		
Average		2	3		2	3	1.5	2	1	3	3	1.5	1.5	3		
Course Correlation Level		2	3		2	3	2	2	1	3	3	2	2	3		

Correlation Levels: 3 - High 2 – Medium 1 – Low

LIST OF EXPERIMENTS/EXERCISES:

Part – I: CIVIL ENGINEERING MATERIALS

A. PROPERTIES AND IDENTIFICATION OF CIVIL ENGINEERING MATERIALS

1. Properties and identification of building materials
2. Market survey for building materials

B. TESTS ON BRICK

3. Visual inspection test for color, shape and size
4. Determination of soundness of brick
5. Water absorption test of brick
6. Efflorescence test of brick
7. Determination of compressive strength of brick

C. TESTS ON TIMBER

8. Identification of defects in timber
9. Determination of moisture content of timber
10. Determination of volumetric shrinkage of timber
11. Determination of density of timber

D. TESTS ON TILES

12. Determination of water absorption of vitrified tile
13. Determination of bulk density of vitrified tile
14. Determination of water absorption of cement concrete floor tile
15. Determination of flatness of cement concrete floor tile
16. Determination of abrasion resistance of vitrified/cement concrete floor tile
17. Determination of flexural strength of tile
18. Determination for compressive strength of paver block tile

PART- II: CONSTRUCTION TECHNOLOGY

A. INDENTIFICATION OF CONSTRUCTION EQUIPMENT

1. Specifications and identification of construction equipment
2. Market survey for construction equipment

B.MASONRY

3. Construction of masonry brick wall using English bond
4. Construction of masonry brick wall using Flemish bond
5. Plastering and pointing

C. BAR BENDING AND REINFORCEMENT

6. Bar bending of reinforcement skeleton for foundations, columns, beams, slabs, lintels, arches, vaults and stair cases.

D. PAINTING

7. External wall painting
8. Internal wall painting

E. HOUSE WIRING

9. 16 A Line
10. 6 A Line

F. SHUTTERING AND SCAFFOLDING

11. Shuttering for beams and slabs
12. Shuttering for columns and Walls
13. Steel scaffolding
14. Single and double scaffolding

REFERENCE BOOKS:

1. Duggal, S. K., *Building Materials*, New Age International Publishers, 4th Edition, 2012.
2. Neville,A. M.,*Properties of Concrete*, John Wiley and Sons, New Delhi, 5th Edition, 2011.

LABORATORY MANUALS:

1. *Civil Engineering Materials and Construction Technology Manual (SVEC20 Regulations)*, Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

IS Codes:

1. IS 1708 (Part-3) : Testing of Small Clear Specimen of Timber
2. IS 3364 (Part-1 & 2) – 1976 : Evaluation of Defects in Timber
3. IS 687 – 2008 : Tests for Bamboo
4. IS 1237 – 2012 : Specifications for Cement concrete Floor Tiles
5. IS 13630 (Part-2)- 2006 : Ceramic Tiles - Methods of Test, Sampling
6. IS 15658 – 2006 : Precast Concrete Blocks for Paving
7. IS 1077 - 1992 : Burnt Clay Building Brick
8. IS 7293 – 1974 : Working with Construction Machinery
9. IS 2212 – 1991 : Practice for Brick work
10. IS 2502 – 1993 : Practice for Bar Bending and Fixing of Bars
11. IS 2395 (Part-1) – 1994 : Practice for Painting Concrete
12. IS 732 – 1989 : Practice for Electrical Wiring Installations
13. IS 1467 - 1999 : Guidelines for False-work for Concrete Structures

II B.Tech. – I Semester

(20BT30132) **FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**

(Common to CE and ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Courses onFluid Mechanics, Hydraulic Engineering/Fluid Mechanics and Hydraulic Machinery

COURSE DESCRIPTION: Calibration of flow meters; Verification of Bernoulli's equation; Performance of turbines and pumps; Losses through pipes.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluate fluid flow characteristics using appropriate tools and techniques to solve fluid mechanics problems by following latest developments and ensuring safety.
CO2. Evaluate the performance and behaviour of hydraulic machinery using appropriate tools and techniques to solve hydraulic machinery problems by following latest developments and ensuring safety.
CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on fluid mechanics and hydraulic machinery.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	3	2		3	1	1			2	1		2			3
CO2	5	3	2		3	1	1			2	1		2			3
CO3	4	3	2		3	1	1			2	1		2			3
Average		3	2		3	1	1			2	1		2			3
Course Correlation Level		3	2		3	1	1			2	1		2			3

Correlation Levels: 1: H – High 2: M – Medium 3: L - Low

LIST OF EXPERIMENTS:

1. Calibration of venturimeter
2. Calibration of orificemeter
3. Determination of coefficient of discharge for a small orifice by a constant head
4. Determination of coefficient of velocity for small orifice by variable head method
5. Calibration of rectangular notch
6. Determination of loss of head due to sudden contraction
7. Determination of coefficient of friction for pipes
8. Verification of Bernoulli's equation
9. Study of impact of jet on vanes
10. Study of hydraulic jump

11. Performance test on Pelton wheel
12. Performance test on Francis turbine
13. Performance test on Kaplan turbine
14. Performance test on single stage centrifugal pump
15. Performance test on multi stage centrifugal pump
16. Performance test on reciprocating pump

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Fluid Mechanics and Hydraulic Machinery Laboratory Manual(SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

II B. Tech. – I Semester

(20BT30133)**SURVEYING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Course onSurveying

COURSE DESCRIPTION: Exercises on Chain surveying; Compasssurveying; Plane table surveying; Auto Levelling; Theodolitesurveying; Total station surveying; Drone surveying.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop survey plots using chain, compass, planetable, theodolite, total station and drone surveying techniques to solve complex surveying problems following ethics and latest developments considering society, environment and sustainability.
CO2. Develop contour maps using auto level, total station and drone surveying techniques to solve complex surveying problems following ethics and latest developments considering society, environment and sustainability.
CO3. Design simple curvesto solve transportation engineering problems using appropriate techniques following ethics and considering society.
CO4. Analyze survey plots for areas using planimeter tool to solve complex surveying problems following ethics and considering society.
CO5. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on surveying practice.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	3	3	3	2	2	2	1	1				1			3
CO2	6	3	3	3	2	2	2	1	1				1			3
CO3	6	3	3	3	3	2	2		2							3
CO4	4	3	3		2	2	2		1							3
CO5	4									3	3					2
Average		3	3	3	2.25	3	3	1	1.25	3	3		1			2
Course Correlation Level		3	3	3	3	3	3	1	2	3	3		1			3

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

LIST OF PRACTICAL EXERCISES:

A) CHAIN SURVEY

1. Cross staff survey and plotting
2. Chain traversing and plotting

B) COMPASS SURVEY

16. Determination of area by radiation method andplotting
17. Compass traversing and plotting

C) PLANE TABLE SURVEY

18. Resection – Two point and three point problems

D) LEVELLING

19. Longitudinal and cross–sectioning of a road profileand plotting
20. Contour plan of given area

E) THEODOLITE SURVEY

21. Measurement of horizontal angles by method of repetition and reiteration
22. Trigonometric leveling – Measurement of heightsand distances
23. Setting out a simple curves by Rankine's methodof tangential angles
24. Setting out works for buildings and pipe lines (demonstration only)

F) TOTAL STATION SURVEY

25. Determination of area using total station
26. Determination of remote height using total station
27. Distance, gradient, and differential heightbetween two inaccessible points using total station
28. Stake-out using total station (demonstration only)
29. Traversing using total station (demonstration only)
30. Contouring using total station (demonstration only)

G) AREA BY PLANIMETER

31. Determination of area of irregular figure by using planimeter (demonstration only)

H) DRONE SURVEY

32. Determination of length and area using drone survey (demonstration only)
33. Route mapping using drone survey (demonstration only)
34. Contouring using drone survey (demonstration only)

NOTE:

Minimum 12 experiments shall be conducted excluding demonstration experiments.

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Surveying Laboratory Manual (SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

II B.Tech. – I Semester

(20BT3HS31)**SOFT SKILLS LAB**

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	1	2	2

PRE-REQUISITES: -

COURSE DESCRIPTION:
Body Language, Assertiveness, Goal Setting, Thinking Skills, Team Building, Conflict Management, Technical Report Writing, Résumé Writing, Group Discussions, Interview Skills, Interpersonal Skills & Etiquette.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of career skills by analyzing and applying the techniques and strategies of Goal Setting, Thinking Skills and Etiquettes.
CO2. Analyze the various situations by applying Assertive communication and Non-verbal forms in developing Interpersonal Skills.
CO3. Apply appropriate managerial techniques by analyzing the conflicts in various situations.
CO4. Demonstrate various communication styles by analyzing and applying Thinking Skills in diverse teams as an individual and a team member during Interviews and Group Discussions.
CO5. Analyze and apply appropriate techniques in Report Writing and Résumé Writing to communicate effectively.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	1	-	-	-	-	1	-	-			
CO2	3	2	-	-	1	-	-	-	-	3	-	-			
CO3	2	2	-	-	3	-	-	-	-	1	3	-			
CO4	2	2	-	-	2	-	-	-	3	2	-	-			
CO5	1	1	-	-	2	-	-	-	-	3	-	-			
Average	2.2	1.8	-	-	1.8	-	-	-	3	2	3	-			
Correlation level	2	2	-	-	2	-	-	-	3	2	3	-			

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

List of Exercises:

A minimum of any **ten** experiments are to be conducted among the following:

1. Body Language
Body language basics – Types of Body Language – Facial Expressions and their messages – Eye Contact Insights – Body Posture – Hand gestures and finger movements.

2. Assertiveness
Communication Styles – Benefits – Asserting yourself –Tips – Role Play.

3. Goal Setting
Seven Steps of Goal Setting – Self Motivation – Personal Goal Setting – Setting Career Goals.

4. Thinking Skills
Positive Thinking – Creative Thinking – Lateral Thinking – Logical Thinking – Intuitive Thinking.

5. Team Building
Learning Activities – Management Essentials – Team Building Scenarios.

6. Conflict Management
Ways of Resolving Conflict – Personality Types and Conflict – Conflict Resolution Process – Team Conflict.

7. Technical Report Writing
Objectives – Formats – Types of reports – Writing Styles.
8. Résumé Writing
Structure and Presentation – Planning – Defining Career Objectives – Projecting Strengths and Skills – Cover Letter – Formats and Styles.

9. Group Discussions
Types of GD – Dos and Don'ts – Dynamics of GD – Intervention – Summarization Techniques.

10.Interview Skills
Planning – Opening Strategies – Answering Strategies – Teleconferencing – Videoconferencing – Practice questions – Dress code.

11.Interpersonal Skills
Starting a Conversation – Responding to a Conversation – Conversation Examples – Body Language – Role Play.

12.Etiquette
Basic Social Etiquette – Telephone Etiquette – Dining Etiquette – Conference Etiquette – E-Mail Etiquette

TOPICS FOR SELF STUDY:
- Attitude
- Time Management
- Positive Thinking
- Negotiation Skills

TEXTBOOKS:

1. Department Lab Manual – SVEC 20

REFERENCE BOOKS:

1. Dr. K. Alex, *Soft Skills*, S. Chand & Company LTD, Latest Edition, New Delhi, 2018.
2. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata McGraw-Hill Publishing Company Limited, Third Edition, New Delhi, 2012.

SOFTWARES / TOOLS:
S1. K - VAN Solutions.
S2. Learning to Speak English 8.1, The Learning Company – 4 CDs.

ADDITIONAL SOFTWARES:

- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- Language in Use 1, 2 & 3.
- Cambridge Advanced Learner's Dictionary - 3rd Edition.
- Let's Talk English, Regional Institute of English South India.

ONLINE LEARNING RESOURCES:

1. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
2. http://job-search-search.com/interviewing/behavioral_interviews
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. https://goo.gl/FEMGXS

II B.Tech. I Semester

(20BT3MC01) **ENVIRONMENTAL SCIENCE**

(Mandatory Course)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	-	30	2	-	-	-

PRE-REQUISITES:-

COURSE DESCRIPTION: Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze natural resourcesto solve complex environmental problems andnatural resource management considering society, environment and sustainability.

CO2. Analyze ecosystemsand biodiversity to solve complex environmental problems by following environmental ethics considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze various types of pollution and their control measures to solve environmental problemsthrough appropriate tools and techniques following latest developmentsconsidering society, ethics, environment and sustainability.

CO4. Analyzesocial issues and its impact on environment, environmental acts to solve complex environmental problems considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze human population and its impact on environment to solve complex environmental problems through team work and using appropriate tools and techniques considering ethics, society, environment and sustainability.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2		1	1				1				3
CO2	4	3	3		2		1	1	1		1					3
CO3	4	3	3		2	1	1	1	1				1			3
CO4	4	3	3		3		1	1	1		1					3
CO5	4	3	3		2	1	1	1	1	1						2
Average		3	3	-	2	1	1	1	1	1	1	1	1	-	-	3.00
Course Correlation Level		3	3	-	3	1	1	1	1	1	1	1	1	-	-	3

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT - I: NATURAL RESOURCES (07 periods)

Multidisciplinary nature of environment; Natural Resources: Renewable and non-renewable resources; Forest, Water, Mineral, Food and Energy resources -Causes, Effects, Remedies, Case studies; Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

UNIT - II: ECOSYSTEMS AND BIODIVERSITY (07 periods)

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem - Producers, Consumers, Decomposers; Food chains, Food webs, Ecological pyramids – Types; Characteristic features, Structure and functions of forest ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity: Concept and value of biodiversity,Role of biodiversity in addressing new millennium challenges, Hot spots of biodiversity, Threats to biodiversity, Man-wild life conflicts, Endemic, Endangered and extinct species of India, Conservation of biodiversity – In-situ and ex-situ.

UNIT - III: ENVIRONMENTAL POLLUTION AND CONTROL (06 periods)

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management – Urban waste, industrial waste; Latest developments in pollution control, Hazards and disaster management – Floods, Earthquakes, Tsunamis, Case studies.

UNIT - IV: SOCIAL ISSUES AND THE ENVIRONMENT (06 periods)

Sustainable development, Urban problems related to energy, Environmental ethics – Issues, Solutions; Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and case studies, Wasteland reclamation, Consumerism and waste products, Concept of green technologies,Environment justice: National Green Tribunal and its importance; Environment protection act, Air act, Water act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation, Public environmental awareness.

UNIT - V: HUMAN POPULATION AND THE ENVIRONMENT (04 periods)

Population growth, Population characteristics and variation among nations, Population explosion, Family welfare programme, 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/Assignment/Seminar on Environmental assets – Water bodies/Forest/Grassland/Hill/Mountain.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Anubha Kaushik and Kaushik, C. P., *Perspectives in Environmental Studies*, New Age International (P) Ltd. Publications, 6th Edition, 2018.
2. Erach Barucha, *Environmental Studies,* Orient Blackswan, 3rd Edition, 2021.

REFERENCE BOOKS:

1. Cunningham, W.P. and Cunningham, M.A., *Principles of Environmental Science*, Tata McGraw-Hill PublishingCompany, New Delhi, 8th Edition,2016.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2nd Edition, 2009.
3. Anji Reddy, M., *Text Book of Environmental Science and Technology*, BS Publications, Revised Edition, 2014.
4. Rajagopalan, R., *Environmental Studies*, Oxford University Press, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Chauhan, B. S., *Environmental Studies*, University Science Press, 2nd Edition, 2018.
2. Botkin, D. B. and Keller, E. A., *Environmental Science: Earth as a Living Planet*, John Wiley & Sons, 9th International Student Edition, 2014.

II B.Tech.– II Semester

(20BT40101) **ENGINEERING HYDROLOGY**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Fluid Mechanics

COURSE DESCRIPTION: Hydrologic cycle; Applications and history; Weather and seasons in India; Precipitation; Evaporation; Evapotranspiration; Runoff; Streamflow; Groundwater hydrology; Hydrograph analysis; Design flood; Erosion; Reservoir sedimentation.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze hydrologic cycle and precipitation to solve complex hydrology problems using appropriate techniques considering environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze abstractions from Precipitation and runoff using appropriate tools and techniques for solving complex hydrology problems considering safety, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze groundwater hydrology to solve complex problems using appropriate tools and techniques following latest developments and considering safety, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze hydrographs using appropriate techniques to solve complex hydrology problems considering environment and sustainability besides communicating effectively in graphical form.

CO5. Design floods using appropriate techniques to solve flood routing problems following ethics and considering safety, environment and sustainability besides communicating effectively in graphical form.

CO6. Analyze erosion and reservoir sedimentation to solve complex problems using appropriate techniques and considering safety, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	1	3		1	1		2			1					3
CO2	4	2	3		1	2	2	2			1					3
CO3	4	2	3		2	2	1	2			1		1			3
CO4	4	2	3		2	1		2			1					3
CO5	6	2	2	3	1	1	2	2	2		1					3
CO6	4	2	3		1	2	2	2			1					3
Average		1.83	2.83	3.00	1.33	1.5	1.75	2.00	2.00		1.00		1.00			3.00
Course Correlation Level		2	3	3	2	2	2	2	2		1		1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT- I: HYDROLOGY AND PRECIPITATION (09 Periods)

Scope of hydrology, Hydrologic cycle, Practical applications and historical development; *Precipitation*-Types and forms, Weather and seasonsin India, Measurement of rainfall; Recording and non-recording rain gauges, Errors, Analysis and interpretation of rainfall data, Methods of calculation of mean precipitation over an area.

UNIT -II: ABSTRACTIONS FROM PRECIPITATION AND RUNOFF (09 Periods)

***Abstractions from Precipitation*:** Process, Factors, Estimation, Methods of reduction of evaporation**,** Evapotranspiration - Factors, Measurement, Estimation, Penman Monteith method; Infiltration – Process, Factors, Double ring infiltrometer, Infiltration equation and indices, Interception, Horton's equation and Green Ampt method.

Runoff: Components, Factors, Rainfall–runoff relationships, Flow mass curve, Flow duration curve, Mass curve of rainfall, Hyetograph, Double mass curve; Streamflow - Concept, Measurement, Stage, Discharge - Area velocity method, Moving boat method.

UNIT - III: GROUNDWATER HYDROLOGY (09 Periods)

Occurrence and movement of groundwater, Darcy's law and its application, Types and properties of aquifers, Conjunctive use and it's necessity; Confined and unconfined flow equations; Well hydraulics - Steady and unsteady flow, Well losses, Specific capacity, Pumping and recuperation test; Pollution of groundwater - Sources, Seawater intrusion; Artificial recharge techniques, Groundwater exploration – Methods, Latest developments.

UNIT - IV: HYDROGRAPH ANALYSIS AND DESIGN FLOOD (10 Periods)

Components of hydrograph, Unit hydrograph, Derivation, Use and limitation of unit hydrograph, Design flood – Estimation of peak discharge, Methods - Envelope curves, Empirical formulae, Rational method, Unit hydrograph method, S-Curve unit hydrograph, Frequency analysis, Gumbel's and log Pearson Type III methods; Flood routing– Concepts of flow routing, hydraulic and hydrologic routing, Reservoir routing, Channel routing, Muskingum's method.

UNIT - V: EROSION AND RESERVOIR SEDIMENTATION (08 Periods)

Erosion process, Estimation of sheet erosion, Channel erosion, Movement of sediment from watersheds, Sediment yield from watersheds, Trap efficiency, Density of sediment deposits, Distribution of sediment in reservoir, Life of a reservoir, Reservoir sedimentation control, Erosion and reservoir sedimentation problems in India.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Subramanya, K.,*Engineering Hydrology*, Tata McGraw–Hill Education Pvt. Ltd., 5th Edition, 2020.
2. Jaya Rami Reddy, P.,*A Text Book of Hydrology,*University Science Press, An Imprint of Laxmi Publications Pvt. Ltd., 3rd Edition, 2011.

REFERENCE BOOKS:

1. Raghunath, H. M.,*Ground Water,* Wiley Eastern Ltd., 3rd Edition, 2009.
2. David Keith Todd, *Groundwater Hydrology,* Wiley India Pvt. Ltd., 3rd Edition, 2011.
3. Chow., V. T., *Hand Book of Applied Hydrology,* Mc Graw–Hill Education Pvt. Ltd., 3rd Edition, 2011.
4. Ojah, C. S. P., Berndtsson, R., Bhunya, P., *Engineering Hydrology,* Oxford Higher Education, 5th Edition, 2008.

ADDITIONAL LEARNING RESOURCES:

1. Singh, V.P.,*Handbook of Applied Hydrology*, McGraw Hill Education, 2nd Edition, 2016.
2. Santosh Kumar Garg, *Water Resources Engineering (Vol. I): Hydrology, Flood Control and Groundwater Engineering,* Khanna Publishers, Delhi, 25th Revised Edition, 1973.
3. Murthy, V.V.N. and Madan Kumar Jha, *Land and Water Management Engineering*, Khalyani Publishers, New Delhi,7th Edition, 2019.
4. Ray K. Linsley, Max Adam Kohler and Joseph L. H.,*Hydrology for Engineers*, McGraw-Hill Series in Water Resources and Environmental Engineering, McGraw-Hill Education, 3rd Edition, SI Metric Edition, 1988.

II B.Tech. – II Semester

(20BT40102) **ENVIRONMENTAL ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: Course onEnvironmental Science

COURSE DESCRIPTION: Water Sources, Quality and Quantity, Intakes; Water Treatment and Distribution Systems; Sewage Characteristics, Collection and Quantity; Sewage Treatment; Sewage Effluent, Sludge Treatment and Disposal.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze water sources, quality and quantity using different tools and techniques for solving water supply problems considering codes of practice, public health and safety, environment and sustainability.

CO2. Design water treatment and distribution systemsusing different methods to solve water supply problemsby following current developments and considering codes of practice, public health and safety, environment and sustainability besides communicating graphically.

CO3. Design sewage collection systems for treatment and disposal to solve complex problems considering appropriate methods, code of practices, public health and safety, environment and sustainability.

CO4. Design sewage treatment and sludge digestion units to solve complex problemsby following latest developments and considering code of practices, public health and safety, environment and sustainability besides communicating graphically.

CO5. Analyze sewage effluent, sludge treatment and disposal,house drainage plumbing systems in buildings using different tools and techniques considering codes of practice, health and safety, environment and sustainabilitybesides communicating graphically.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		3	2	2	2	2							3
CO2	6	3	2	3	2	2	2	1	2		1		1			3
CO3	6	3	3	3	2	2	2	2	2							3
CO4	6	3	3	3	2	2	2	1	2		1		1			3
CO5	4	3	2			2	2	2	2		1					3
Average		3	2.6	3	2.25	2	2	1.6	2		1		1			3
Course Correlation Level		3	3	3	3	2	2	2	2		1		1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT - I: WATER SOURCES, QUALITY AND QUANTITY, INTAKES (06 Periods)
Water Sources –Types,Quality, Quantity, Drinking water quality analysis and standards; Protected water supply – Need, Objectives; Population forecasting – Methods, Design period; Water demand – Types, Per capita demand, Factors affecting, Fluctuations; Intakes – Types, Factors influencing site selection.

UNIT- II: WATER TREATMENT AND SUPPLY (12 Periods)
Water Treatment:Units, Functions,Processes – Aeration, Coagulation, Flocculation, Optimum Coagulant Dosage; Sedimentation – Types, Factors affecting, Design of sedimentation tank; Filtration – Types; Slow and Rapid Gravity Sand Filters - Design, Operation and Maintenance; Disinfection –Methods, Chlorination, Chlorine demand, Break point chlorination; Latest techniques in water treatment.
Water Supply: Systems and methods; Distribution systems – Layouts, Design by Hardy Cross and equivalent pipe methods; Water supply arrangements in buildings - Flow meters, Pipe appurtenances, Laying and testing of pipe lines, Leakage prevention, Repair and maintenance.

UNIT – III: SEWAGE CHARACTERISTICS, COLLECTION AND QUANTITY (06 Periods)
Sewage characteristics - Physical, Chemical and Biological; Sewage collection systems – Types, Comparison; Estimation of sanitary sewage and storm water runoff, Hydraulic design of sewers, Sewer appurtenances, BODEquations and Self purification of streams.

UNIT – IV: SEWAGE TREATMENT (12 Periods)
Layout of sewage treatment plant; Design of primary treatment units - Screen chamber, Grit chamber, Sedimentation tank; Design of secondary treatment units – Attached growth systems - Trickling filters, Rotating Biological Contactors, Bio-towers; Suspended growth systems - Activated Sludge process, Oxidation ditch, Stabilisation pond; Design of sludge digestion tank – Aerobic and anaerobic, Factors influencing the digestion process; Latest techniques in sewage treatment.

UNIT – V: SEWAGE EFFLUENT, SLUDGE TREATMENT AND DISPOSAL (9 Periods)
Disposal of sewage effluent – Dilution, Sewage farming, ISI Effluent disposal standards; Design of septic tank, Soak pit, Dispersion trench; Sludge treatment and disposal, House drainage plumbing systems in buildings.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Birdie, G. S. and Birdie, J. S., *Water Supply and Sanitary Engineering*, Dhanpat Rai and Sons Publishers, 9th Edition, 2011.
2. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, *Environmental Engineering*, McGraw Hill Inc., 1985.

REFERENCE BOOKS:

1. Garg, S. K., *Environmental Engineering, (Vol. I): Water Supply Engineering*, Khanna Publishers, 20thEdition, 2011.
2. Garg, S. K., *Environmental Engineering (Vol. II): Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, 27thEdition, 2013.
3. Metcalf and Eddy, *Wastewater Engineering*, TMH Education Pvt. Ltd., 4thEdition, 2010.
4. Elangovan, R. and Saseetharan, M.K, *Unit Operations in Environmental Engineering*, New Age International (P) Limited, 1st Edition, 2008.

ADDITIONAL LEARNING RESOURCES:

1. Duggal, S. K., *Elements of Environmental Engineering,* S. Chand Publishing, 3rd Edition, 2013.
2. Modi, P. N., *Water Supply Engineering(Environmental Engineering-I)*, Standard Book House, 6thEdition, 2018.
3. Modi, P.N., *Sewage Treatment Disposal and Wastewater Engineering (Environmental Engineering-II)*, Standard Publishers Distributors, 17thEdition, 2019.
4. Punmia, B.C., Ashok K. Jain and Arun K. Jain, *Environmental Engineering-II: Wastewater Engineering (Including Air Pollution),* Laxmi Publications, 2ndEdition, 2019.

II B. Tech. – II Semester

(20BT40103)**SOIL MECHANICS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:-Courses on Engineering Mechanics, Engineering Geology Lab.

COURSE DESCRIPTION: Basic principles of soil mechanics and their application in engineering practice; Index properties; Engineering properties - Permeability and Seepage, Stress distribution and Compaction, Consolidation, Shear strength.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze index properties of soil using appropriate tools and techniques to solve complex soil engineering problems by following the relevant codes of practice and through continuous learning ensuring cost effectiveness besides communicating effectively in graphical form.

CO2. Analyze permeability and seepage through soils using appropriate tools and techniques to solve complex soil engineering problems by following the relevant codes of practice and ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze stress distribution and compaction characteristics of soils using appropriate tools and techniques to solve complex soil engineering problems by following the relevant codes of practice and latest developments ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze consolidation characteristics of soils using appropriate tools and techniques to solve complex soil engineering problems by following the relevant codes of practice ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze shear strength characteristics of soils using appropriate tools and techniques to solve complex soil engineering problems by following the relevant codes of practice and ensuring safety, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2	2			2		2	1	1		3	
CO2	4	3	3		2	2	1	1	2		2				3	
C03	4	3	3		2	2	1	1	2		2	1	1		3	
CO4	4	3	3		2	2	1	1	2		2				3	
CO5	4	3	3		2	2	1	1	2		2				3	
Average		3.00	3.00		2.00	2.00	1.00	1.00	2.00		2.00	1.00	1.00		3.00	
Course Correlation Level		3	3		3	3	1	1	2		2	1	1		3	

Correlation Levels: 3: H - High 2: M - Medium 1: L– Low

DETAILED SYLLABUS:

UNIT – I: INDEX PROPERTIES OF SOILS (09 Periods)

Soil formation, Types of soils, Soil structure and clay mineralogy, Adsorbed water, Volume–weight relationships, Three–phase diagram, Moisture content, Specific gravity, In–situ density, Relative density, Grain size analysis – Sieve and hydrometer methods, Plasticity of soils, Consistency limits and indices, I.S. Classification of soils, Sensitivity, Thixotropy, Activity of soil, Field identification of soils, Latest methods.

UNIT – II: PERMEABILITY AND SEEPAGE THROUGH SOILS (09 Periods)

Permeability: Soil water, Capillary rise, Flow of water through soils, Darcy's law, Permeability, Factors affecting permeability, Laboratory determination of coefficient of permeability, Permeability of layered systems.

Seepage through Soils: Effective stress principle, Effective stress under different loading conditions, Seepage pressure, Quicksand condition, Seepage through soils, Flownets – Characteristics and uses; Seepage through earth dams with horizontal filter, Critical hydraulic gradient.

UNIT – III: STRESS DISTRIBUTION IN SOILS AND COMPACTION (09 Periods)

Stress Distribution in Soils: Boussinesq's theory - Point loads, Line loads, Circular and rectangular loaded areas; Westergaard's theory, Newmark's influence chart, Approximate methods, Contact pressure distribution.

Compaction: Mechanism of compaction, Optimum moisture content and maximum dry density, Factors affecting compaction, Effects of compaction on soil properties, Laboratory determination of OMC and MDD, Field compaction – Methods,Latest developments; Compaction control.

UNIT – IV: CONSOLIDATION OF SOILS (09 Periods)

Initial, Primary and secondary consolidation, Spring analogy for primary consolidation, Consolidation test– e–p and e–log p curves; Terzaghi's theory of one dimensional consolidation – Coefficient of consolidation; Pre-consolidation pressure, Secondary consolidation.

UNIT – V: SHEAR STRENGTH OF SOILS (09 Periods)

Mohr–Coulomb failure theories, Types of laboratory shear strength tests, Strength tests based on drainage conditions and their field applicability, Shear strength of cohesionless soils, Critical void ratio, Liquefaction, Shear strength of cohesive soils, Skempton's pore pressure coefficients.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. GopalRanjan and Rao,A. S. R.,*Basic and Applied Soil Mechanics,* New Age International Pvt. Ltd., 3rd Revised Edition, 2016.
2. Arora, K. R.,*Soil Mechanics and Foundation Engineering,* Standard Publishers and Distributors, 7thEdition, 2021.

REFERENCE BOOKS

1. Das, B.M. and Sobhan, K.,*Principlesof Geotechnical Engineering,* Cengage Learning India, 9th Edition, 2018.
2. Punmia,B. C., Jain, A. K. and Jain, A. K.,*Soil Mechanics and Foundation,*Laxmi Publications Pvt. Ltd., 16th Edition, 2019.
3. Venkatramaiah,C.,*Geotechnical Engineering,* New Age International Publishers, 5th Edition, 2017.
4. Lambe, T. W. and Whitman, R. V., *Soil Mechanics,* John Wiley and Sons, Singapore, 1st Edition, 1991.

ADDITIONAL LEARNING RESOURCES:

1. Handy, R. and Spangler, M., *Geotechnical Engineering Soil and Foundation Principles and Practice*, McGraw-Hill Education, 5th Edition, 2007.
2. Holtz, R.D., Kovacs, W.D. and Sheahan, T.C., *An Introduction to Geotechnical Engineering*, Pearson Publication, 2nd Edition, 2011.

II B. Tech. – II Semester

(20BT40104) **STRUCTURAL ANALYSIS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses onEngineering Mechanics, Mechanics of Solids

COURSE DESCRIPTION: Deflection of beams; Energy method; Fixed beams; Clapeyron's theorem; Slope deflection method; Moment distribution method; Kani's method; Moving loads and influence lines; Plastic analysis.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze slope and deflection of beams and pin-jointed trussesto solve complex structural analysis problems using various methods besides communicating effectively in graphical form.
CO2. Analyze fixed beams using force method to solve complex structural analysis problems besides communicating effectively in graphical form.
CO3. Analyze continuous beams using various methods to solve complex structural analysis problems besides communicating effectively in graphical form.
CO4. Analyze determinate beams using the concept of moving loads and influence lines to solve complex structural analysis problems besides communicating effectively in graphical form.
CO5. Analyze beams using plastic analysis technique to solve complex structural failures ensuring safety besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2	1					1			3		
CO2	4	3	3		2	1					1			3		
CO3	4	3	3		2	1					1			3		
CO4	4	3	3		2	1					1			3		
CO5	4	3	3		2	1	1				1			3		
Average		3	3		2	1	1				1			3		
Course Correlation Level		3	3		2	1	1				1			3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: DEFLECTION OF BEAMS (09 Periods)

Bending into a circular arc, Slope, deflection and radius of curvature; Differential equation for the elastic curve of a beam, Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L. and uniformly varying loads; Double integration method, Macaulay's method, Moment area method, Conjugate beam method,Deflections of propped cantilevers for simple loading cases.

UNIT – II: ENERGY METHOD AND FIXED BEAMS (09 Periods)

Energy Method: Strain in linear elastic system, Expression of strain energy due to axial load, BM and SF, Castigliano's first theorem, Deflections of simple beams and pin-jointed plane trusses.

Fixed Beams: Shear force and bending moment diagrams for fixed end moment due to - Point loads, uniformly distributed load, Uniformly varying load, Couple and combination of loads, Effect of sinking and rotation of support, Deflection of fixed beams.

UNIT – III: CLAPEYRON'S THEOREM AND SLOPE DEFLECTION METHOD (09 Periods)

Clapeyron's Theorem:Continuous beams, Clapeyron's theorem of three moments, Analysis of continuous beams with one or both ends fixed, Continuous beams with overhang, Effect of sinking of supports.

Slope–Deflection Method: Basic concepts, Slope deflection equation, Application to continuous beams with and without settlement of supports.

UNIT - IV: MOMENT DISTRIBUTION METHOD AND KANI'S METHOD (09 periods)

Moment Distribution Method:Basic concepts, Stiffness factor, Carryover, Distribution factor, Application to continuous beams with and without settlement of supports.

Kani's Method:Basic concepts, Rotation contribution, Rotation factor, Analysis of continuous beams with and without settlement of supports.

UNIT – V: MOVING LOADS, INFLUENCE LINES AND PLASTIC ANALYSIS (09 Periods)

Moving Loads and Influence Lines:Moving loads;Influence line for support reaction, SF and BM; Load position for maximum SF and for maximum BM at a section; Loading - Point loads, UDL longer than the span, UDL shorter than the span; Equivalent uniformly distributed load.

Plastic Analysis:Idealized stress–strain diagram, Momentcurvature relationships, Shape factors for various sections, Plastic hinge, Upper bound and lower bound theorems; Collapse loads and plastic moments for simply supported beams, Propped cantilevers, Fixed beams and continuous beams.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Vazirani, V. N., Ratwani, M. M. and Duggal, S. K.,*Analysis of Structures– Vol. I and Vol. II*, Khanna Publications, 17th Edition, 1999.
2. Vaidyanathan, R. and Perumal, P.,*Structural Analysis - Vol. I and II*, Laxmi Publications, 4th Edition, 2016.

REFERENCES:

1. Bhavikatti, S. S., *Structural Analysis– Vol. I and II*, Vikas Publishing House, 4th Edition, 2013.
2. Khurmi, R. S. and Khurmi,N., *Theory of Structures*, S. Chand & Company Ltd., 12th Edition, 2020.
3. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *SMTS–II – Theory of Structures*, Laxmi Publications (P) Ltd., 13thEdition, 2017.
4. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, DhanpatRai Publishing Co. Ltd., 9thEdition, 2014.

ADDITIONAL LEARNING RESOURCES:

1. DevdasMenon, *Structural Analysis,* Alpha Science International Ltd., 2nd Edition, 2017.
2. Hibbeler, R. C., *Structural Analysis,* Pearson Education, 9th Edition, 2017.
3. Wang, C. K., *Intermediate Structural Analysis,* McGraw Hill Education, Indian Edition, 2017.
4. Pandit, G., Gupta, S. and Gupta, R., *Theory of Structures – Vol. I and II*, Tata Mc–Graw Hill Publishing Co. Ltd., 1st Edition, 2017.
5. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *Mechanics of Materials*, Laxmi Publications Pvt. Ltd., 2001.

II B.Tech. – II Semester

(20BT4BS01)**MATERIAL SCIENCE**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Introduction to material science and engineering; properties, processing and applications of composite materials; smart materials; nano and biomimetic materials; emerging materials.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the basic knowledge on different materials.
CO2. Analyze the structure and properties of various composites used in commercialaircraft, marine grade sandwich and wind turbine blades using different methods.
CO3. Demonstrate the basic properties of piezoelectric, magneto-rheostatic, electro-rheostatic, and shape memory alloys used for different applications.
CO4. Analyze the properties of nano materials for NEMS & biomimetic materials fordolphin sound wave technology and apply Lithographic technique for deposition ofnanomaterials.
CO5. Demonstrate the processing and properties of functionally graded materials fornanoelectronic and optoelectronic applications.

Mapping of COs with POs

Course Outcomes	Program Outcomes											
	PO1	***PO2***	***PO3***	***PO4***	***PO5***	***PO6***	***PO7***	***PO8***	***PO9***	***PO10***	***PO11***	***PO12***
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	3	-	-	-	-	-	-
CO3	3	-	-	-	-	2	-	-	-	-	-	-
CO4	3	-	-	-	-	3	-	-	-	-	-	-
CO5	3	-	-	-	-	2	-	-	-	-	-	-
Average	3	3	-	-	2	2.5	-	-	-	-	-	-
Course Correlation Level	3	3	-	-	2	3	-	-	-	-	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO MATERIAL SCIENCE AND ENGINEERING (7 Periods)

Introduction - material science and engineering, engineering materials and advanced materials, modern materials needs, processing and properties of metals, polymers and ceramics (Qualitative).

UNIT- II: COMPOSITE MATERIALS (10 Periods)

Composite materials – classification based on matrix phase and dispersed phase – functions of matrix phase and dispersed phase – polymer matrix composites and structural composites – applications (commercial aircraft, marine grade sandwich and wind turbine blades), basic composite manufacturing methods: prepeg-up process, wet lay –up (hand lay –up) process - advantages and limitations of composites.

UNIT- III:SMART MATERIALS (08 Periods)

Smart materials – piezoelectric, magneto-rheostatic (MR) and electro-rheostatic (ER) materials - shape memory alloys (SMA): characteristics, preparation of SMA, applications in different fields, advances in smart materials.

UNIT – IV: NANO AND BIOMIMETIC MATERIALS (10 Periods)

Nanomaterials: Low dimensional structures and energy quantization, Fabrication of nano materials: Lithographic technique using photons, properties of nano materials (metallic, semiconducting and magnetic) and applications (renewable energy and nano electro-mechanical systems (NEMS).

Biomimetic materials – Introduction- classification and their applications of biomimetic materials (Lotus effect, Dolphin sound wave technology and viper as a model in its defence)

UNIT- V: EMERGING MATERIALS (10 Periods)

Functionally graded materials (FGM): Types, properties, processing and potential applications, functionally graded fiber cement: mixture design, processing and as structural material, Functionally Graded Nanoelectronic, Optoelectronic and Thermoelectric Materials (Qualitative) and its applications.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. K M Gupta, *Engineering Materials – Research, Applications and Advances*, CRC press (Taylor & Francis group), 2015.
2. William D Callister, David G Rethwisch, *Materials Science and Engineering*, Wiley, 9th Edition, 2014.

REFERENCE BOOKS:

1. Sulabha K Kulkarni*, Nanotechnology: Principles and practices*, Springer, 9th Edition, 2014.
2. Charles P. Poole and Frank J. Owens, *Introduction to Nanotechnology*, Wiley-Interscience, May 2003.

II B.Tech. – II Semester

(20BT4HS02)**BUSINESS COMMUNICATION AND CAREER SKILLS**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:–

COURSE DESCRIPTION: Nature and Scope of Communication, CorporateCommunication, Writing Business Messages & Documents, Careers & Résumés, and Interviews.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of professional communication by analyzing and applying the styles and strategies of business communication in Communication Networks, Interpersonal, and Informal communication.

CO2. Analyze the limitations of communication by applying and demonstrating corporate and cross-cultural communication strategies effectively in a business context and Crisis Management situations.

CO3. Apply appropriate strategies and techniquesinwriting business messages, business letters, and résumé for effective professional communication and career building.

CO4. Demonstrate appropriate communication techniques and answering strategies by analyzing the expectations during presentations and interviews.

Mapping of COs with POs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	2	-	-	-	-	3	-	-
CO2	1	2	-	-	2	-	-	-	-	3	1	-
CO3	1	-	-	-	2	-	-	-	-	3	-	-
CO4	1	2	-	-	2	-	-	-	-	3	-	-
Average	1.5	1.66	-	-	2	-	-	-	-	3	-	-
Course correlation Level	2	2	-	-	2	-	-	-	-	3	1	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT–I: NATURE AND SCOPE OF COMMUNICATION (9 Periods)

Introduction – Communication Basics – Functions of Communication – Communication Networks – Interpersonal Communication – Informal Communication – Communication Barriers – Roles of a Manager.

UNIT–II: CORPORATE COMMUNICATION (9 Periods)

Introduction – Corporate Communication – Cross-Cultural Communication; Concept & Styles – Corporate Communication Strategy – Corporate Citizenship – Crisis Communication: Case Study.

UNIT–III: **WRITING BUSINESS MESSAGES & DOCUMENTS (9 Periods)**

Introduction – Importance of Written Business Communication – Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing – Kinds of Business Letters – Common Components of Business Letters – Strategies for Writing the Body of a Letter.

UNIT–IV: CAREERS AND RÉSUMÉS (9 Periods)

Introduction – Career Building – Résumé Formats: Traditional, Electronic and Video Résumé – Sending Résumés – Follow-up Letters – Business Presentations and Speeches: Planning –Structuring – Organizing – Delivery.

UNIT–V: INTERVIEWS (9 Periods)

Introduction – General Preparation for an Interview – Success in an Interview – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing – Types of Interviewing –Online Recruitment Process.

Total Periods: 45

TOPICS FOR SELF STUDY:

- Effective Managerial Communication
- Communication across Functional Areas
- Business Reports and Proposals
- Group Discussion and Team Presentations
- Meetings and Conferences

TEXT BOOKS:

1. Meenakshi Raman, and Prakash Singh, *Business Communication*, Oxford University
2. Press, New Delhi, 2nd edition, 2012.
3. Neera Jain, and Sharma Mukherji, *Effective Business Communication*, Tata Mc Graw–Hill Education, Pvt. Ltd., New Delhi, 2012.

REFERENCE BOOKS:

1. Courtland L. Bovee et al., *Business Communication Today*, Pearson, New Delhi, 2011.
2. Krizan, *Effective Business Communication*, Cengage Learning, New Delhi, 2010.

ADDITIONAL LEARNING RESOURCES

1. http://www.career.vt.edu/interviewing/TelephoneInterviews.html
2. http://job-search-search.com/interviewing/behavioral_interviews
3. https://goo.gl/laEHOY (dealing with complaints)
4. http://www.adm.uwaterloo.ca/infocecs/CRC/manual/resumes.html
5. https://goo.gl/FEMGXS
6. http://www.resumania.com/arcindex.html

II B.Tech. – II Semester

(20BT4HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITE: --

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the concepts of Entrepreneurship and Entrepreneur.
CO2. Analyze the Ideas and Business Plans for promoting entrepreneurships and start ups.
CO3. Demonstrate the environment of Micro, Small and Medium Enterprises.
CO4. Analyze the various sources of Institutional Financefor promoting entrepreneurship.
CO5. Demonstrate the encouragement for Women and Rural Entrepreneurship.

Mapping of COs with POs

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	2	-
CO3	3	2	-	-	-	-	-	-	-	2	-	-
CO4	-	3	-	-	-	-	-	-	-	-	2	-
CO5	3	-	-	-	-	-	-	-	-	-	2	-
Average	3	2.67	-	-	-	-	-	-	-	2	2	-
Course correlation levels	3	3	-	-	-	-	-	-	-	2	2	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO ENTREPRENEURSHIP (09 Periods)

Introduction to Entrepreneurship - Concept ofEntrepreneurship – Growth of Entrepreneurship in India **-** Factors affecting entrepreneurship growth - Characteristics of an Entrepreneur – Functions of Entrepreneur – Types of Entrepreneurs – Distinction between an Entrepreneur and a manager.

UNIT – II: IDEA GENERATION AND FORMULATION OF BUSINESS PLANS (09 Periods)

Sources of Ideas – Methods of idea generation – Steps in Setting up of a Small Business Enterprise – Concepts of Business Plan – Significance – Formulation of Business Plan – Common Errors in the Formulation of Business Plan – The role of incubation centers for promoting entrepreneurships and start-ups.

UNIT – III: MICRO SMALL AND MEDIUM ENTERPRISES (09 Periods)

Meaning and Definition of Micro, Small and Medium Enterprises – Essential Features – Scope and Objectives of Micro Small and Medium Enterprises – relationship between Micro and Macro Enterprises- Problems of Micro Small and Medium Enterprises.

UNIT–IV: INSTITUTIONAL FINANCE (09 Periods)

Institutional Finance **–** Need – Scope - Services - Various Institutions offering Institutional support: – Small Industries Development of Bank of India (SIDBI), State Industrial Development Corporations (SIDC) – Small Industries Development Organization (SIDO) – Small Industries Service Institutes (SISIs) – State Financial Corporation (SFC) - National Institute of Entrepreneurship and Small Business Development (NIESBUD) – Micro Units Development and Refinance Agency Bank (MUDRA).

UNIT–V: WOMEN & RURAL ENTREPRENEURSHIP (09 Periods)

Concept of Women entrepreneurs - Functions of Women entrepreneurs - Growth of women entrepreneurship in India - Challenges of Women entrepreneurs - Programmes for supporting women entrepreneurship – **Rural Entrepreneurship:** – Meaning, Need for Rural entrepreneurship, Problems of rural entrepreneurship, Role of NGOs, Role of Bharatiya Mahila Bank for encouraging Women Entrepreneurs – Micro Finance & Self Help Groups (Basic Concepts).

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Dr.S.S.Khanka*, Entrepreneurial Development*, S. Chand and Company Ltd,Revised edition,2012.
2. MadhurimaLall&ShikhaSahai, *Entrepreneurship*, Excel Books India, 4th edition, 2014.

REFERENCE BOOKS:

1. Nandan, H., *Fundamentals of Entrepreneurship*, PHI Learning Pvt. Ltd., NewDelhi, 3rd edition,2013.
2. BholanathDutta, *Entrepreneurship Management* – Text and Cases, Excel Books,3rd edition,2015.

II B.Tech. – II Semester

(20BT4HS06) **GERMAN LANGUAGE (Deutsch alsFremdsprache)**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Oral communication; Basic grammar; Basic writing; Berufsdeutcsch (Business German)

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate basic knowledge of German language and the verb conjugation.
CO2. Comprehend and apply the knowledge of vocabulary and phrases in day-to-day real-life conversation.
CO3. Apply the various sentence structures by examining the rules of grammar in speaking and writing.
CO4. Analyze and apply the various verb structure of English and German language effectively in professional writing.

Mapping of COs with POs

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	2	-	-
Average	3	-	-	-	-	-	-	-	-	2	-	-
Course correlation levels	3	-	-	-	-	-	-	-	-	2	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION (9 Periods)

Introduction - German alphabets, numbers, days in a week, names of months, seasons. Grammar: Nouns –(i)Nominative case and (ii) Nominative personal pronouns, simple sentence, Verb Conjugation 1st and 2nd type, verb Conjugation 3rd type, 'Wh' questions (simple sentences) Nominative (definite and indefinite) Articles

UNIT-II: CITY AND FOOD (9 Periods)

In the city: naming places and buildings, means of transport, basic directions. Food: drink, groceries and meals. Apartments: rooms, furniture, colours.
Grammar: Nouns-articles negation–(kein and nicht); imperative and the accusative case; Nominative Possessive Pronouns.

UNIT-III: DAY TO DAY CONVERSATIONS **(9 Periods)**

Everyday life, telling time, making appointments, leisure activities, and celebrations. Different types of professions, Health and the body, Holiday and weather, Clothes and Dresses.

UNIT-IV: BASIC GRAMMAR **(9 Periods)**

Grammar: Possessive articles, Prepositions (am, um, von. bis); Modal verbs, Separable verbs, the accusative, past tense of 'to have' and 'to be', the imperative sentences, dative case, perfect tense.

UNIT V: BASIC WRITING **(9 Periods)**

Translation from English to German and German to English, Contacts, Writing letters and Email Writing.

Total Periods: 45

TEXT BOOKS:

1. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tana Sieber, *NetzwerkDeutsch als Fremdsprache, Kursbuch A1*, Goyal Publishers and Distributors Pvt. Ltd. 2015.
2. Stefanie Dengler, Paul Rusch, Helen Schmitz, Tana Sieber, *Netzwerk Deutsch als Fremdsprache, Arbeitsbuch A1*, Goyal Publishers and Distributors Pvt. Ltd. 2015.

Web link:

1. https://learngerman.dw.com/en/beginners/c-36519789

II B.Tech. – II Semester

(20BT4HS08) **INDIAN HISTORY**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-RQUISITES: --

CORSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate contextual knowledge in evolution of ancient and medieval Indian History and acquire awareness on societal and cultural transformation.

CO2. Analyze the situations before and after Independence and assess the societal reforms implemented in India after Independence.

CO3. Practice culture transformations and appreciate its influence to adapt themselves in global scenario.

Mapping of COs with POs

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	1	-	-	-	-	-	-
CO2	1	2	-	-	-	1	-	-	-	-	-	-
CO3	1	1	-	-	-	2	-	-	-	-	-	-
Average	1.3	1	-	-	-	1.3	-	-	-	-	-	-
Course correlation levels	2	1	-	-	-	2	-	-	-	-	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT- I: INTRODUCTION TO INDIAN HISTORY (8 Periods)

Elements of Indian History; History Sources: Archaeology, Numismatics, Epigraphy & Archival research; Methods used in History; History & historiography; sociological concepts-structure, system, organization, social institutions, Culture and social stratification (caste, class, gender, power), State& Civil Society.

UNIT- II: ANCIENT INDIA (9 Periods)

Mohenjo-Daro civilization; Harappa civilization; Mauryan Empire.

UNIT- III: CLASSICAL & MEDIEVAL ERA (12 Periods)

Classic Era (200 BC - 1200 AD); Hindu - Islamic Era (1200 - 1800 AD).

UNIT- IV: MODERN INDIA (6 Periods)

Age of Colonialism (17th - 19th centuries); First war of Indian Independence; Freedom Struggle (1857-1947)

UNIT-V: INDIA AFTER INDEPENDENCE (1947 -) (10 Periods)

The Evolution of the Constitution and Main Provisions; Consolidation of India as a Nation; Politics in the States; Indian economy; Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing Nature of work and organization.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOK:

1. K. Krishna Reddy, *Indian History,* Tata McGraw-Hill, 21st reprint, 2017.

REFERENCE BOOKS:

1. Guha, Ramachandra, *India after Gandhi*, Pan Macmillan, 2007.
2. Romila Thapar, *Early India***,** Penguin India, New Delhi 2002.

II B.Tech. – II Semester

(20BT4HS10) **PERSONALITY DEVELOPMENT**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Personalities and Leadership Qualities; Self Esteem and self Development; Attitude; Communication Relationship; Critical Work Skills and Ethics.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of leadership qualities by examining and applying personality traits.
CO2. Analyze and apply the proven techniques to build self-esteem and self-confidence.
CO3. Analyze the limitations of attitudes by demonstrating how experiences and circumstances impact attitudes.
CO4. Analyze the role of communication in relationships, qualities of a team player and leadership styles.
CO5. Apply appropriate techniques in solving problems by examining and demonstrating time management, stress management and anger management.

Mapping of COs with POs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	3	-	-	-	-	1	-	-
CO2	1	3	-	-	3	-	-	-	-	1	-	-
CO3	1	2	-	-	3	-	-	-	-	2	-	-
CO4	1	2	-	-	1	-	-	-	2	3	-	-
CO5	1	1	-	-	2	-	-	-	-	3	-	-
Average	1.4	1.8	-	-	2.4	-	-	-	2	2	-	-
Course correlation Level	2	2	-	-	3	-	-	-	2	2	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: PERSONALITIES AND LEADERSHIP QUALITIES (9 Periods)

Introduction: Different Personalities -Personality Analysis -Freudian Analysis - Vedantic Concept: Swamy Vivekananda -Personality Begets - Types - Leadership Qualities - Decision Making**-** Case Studies: Personalities.

UNIT-II: SELF ESTEEM AND SELF DEVELOPMENT (9 Periods)

Know Yourself: Self Image - Positive Self-Esteem - Turn Failure into Success - Be Sensitive to Feedback - Build Self-Confidence - Self Actualization - Set Goals - Action Plans - Accountability - Behavior Modification - Mentoring - Learning - Counseling - Challenge yourself with Aptitude Tests and Internships.

UNIT-III: ATTITUDE **(9 Periods)**

Importance - Difference between Behavior and Attitude - Changing Negative Attitude- Impact of Attitudes on others - Unproductive Attitudes -Assess your Behaviour.

UNIT-IV: COMMUNICATIONRELATIONSHIP **(9 Periods)**

Introduction - Positive and Negative Traits - Grapevine Communication - Open Communication; Team Player - Leadership styles -Performance Evaluations - Electronic Communication; Text Messaging - Voicemail - E-Mail

UNIT-V: CRITICAL WORK SKILLS AND ETHICS **(9 Periods)**

Time Management - Balancing Life and Work - Stress Management - Anger Management - Making Decisions and Solving Problems - Developing Creativity - Ethics and Self-Righteousness - Being Judgmental in the Real World - Striving for Integrity.

Total Periods: 45

TEXT BOOKS:

1. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, 2011.
2. Harold R. Wallace and L. Ann Masters, *Personal Development for Life and Work*, Cengage Learning, Delhi, 10th edition Indian Reprint, 2011. (6th Indian Reprint 2015)

REFERENCE BOOKS:

1. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, 2nd Revised Edition 2011.
2. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th edition 2014.

ADDITIONAL LEARNING RESOURCES

- https://www.universalclass.com/.../the-process-of-perso...
- https://www.ncbi.nlm.nih.gov/pubmed/25545842

II B.Tech. – II Semester

(20BT4HS12) **WOMEN EMPOWERMENT**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	–	–	3

PRE–REQUISITES: --

COURSE DESCRIPTION: Concept & Framework, Status of Women, Women's Right to work, International Women's Decade, and Women Entrepreneurship.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the knowledge of the characteristics and achievements of empowered women and women's empowerment techniques by analyzing women's legal and political status.

CO2. Apply the knowledge of women's rights by analyzing various societal issues and obstacles in different fields, including science and technology.

CO3. Demonstrate the knowledge of significance of women's participation in policy debates, National conferences, and common forums for equality and development by identifying and analyzing issues.

CO4. Analyze the concept of women's entrepreneurship, government schemes, and entrepreneurial challenges and opportunities.

Mapping of COs with POs

Course Outcome	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12
CO1	3	1	–	–	1	3	–	1	–	–	–	–
CO2	3	1	–	–	–	2	–	–	–	–	–	–
CO3	3	1	–	–	–	2	–	–	–	3	–	–
CO4	3	1	–	–	–	–	–	–	–	–	2	–
Average	3	1	–	–	1	2.3	–	1	–	3	2	–
Course Correlation Level	3	1	–	–	1	3	–	1	–	3	2	–

Correlation Levels: 3: H – High 2: M – Medium 1: L – Low

DETAILED SYLLABUS:

UNIT- I: CONCEPT & FRAMEWORK (09 Periods)

Introduction– Empowered Women's Characteristics – Achievements of Women's Empowerment **Concept of Empowerment:** Meaning & Concept – Generalizations about Empowerment – Empowerment Propositions – Choices women can make for empowerment – Women's participation in decision making, development process & in Governance. **Framework for Empowerment** – Five levels of equality – Tenets of Empowerment– Elements – Phases and aspects – Techniques – Categories and Models – Approaches.

UNIT- II: STATUS OF WOMEN (9 Periods)

Legal Status: Present Scenario – Call for Social change – Significant trends – Legal & Schemes – Personal Law – Joint Family – Criminal Law – Shift towards Dowry – Deterrent Punishment – Criminal Law (II Amendment) – Discrimination in Employment.

Political Status: Present Scenario – Political Participation & its Nature – Socio–economic Characteristics – Political Mobilization: Mass Media – Campaign Exposure – Group Orientation – Awareness of issues and participation – Progress & Future Thrust.

UNIT - III: WOMEN'S RIGHT TO WORK (9 Periods)

Introduction – Present Scenario – Changes in Policy & Programme – National Plan of Action– Women's Cells and Bureau – Increase in work participation rate – Discrimination in labour market – Women in unorganized sector – Issues and Obstacles– Women in Education – Women in Science & Technology – **Case Study:** Linking Education to Women's Access to resources.

UNIT - IV: WOMEN'S PARTICIPATORY DEVELOPMENT (9 Periods)

Dynamics of social change – conscious participation – Information Explosion – Organized Articulation – National Conference – Common Forums – Participatory Development – New Issues Identified – Role of other Institutions.

UNIT - V: WOMEN ENTREPRENEURSHIP (9 Periods)

Introduction – Definition – Concept – Traits of women Entrepreneurs – Role of women Entrepreneurs in India – Reasons of Women Entrepreneurship – Government schemes & Financial Institutions to develop Women Entrepreneurs – Key policy recommendations – Project Planning – Suggestions and measures to strengthen women entrepreneurship – Growth & Future challenges – Training and Opportunities – **Case Study:** Training Women as Hand–pump Mechanics– **Case Study** : Literacy for Empowering Craftswomen

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. SahaySushama. *Women and Empowerment.* Discovery Publishing House, New Delhi. 2013.
2. NayakSarojini, Jeevan Nair. *Women's Empowerment in India*. Pointer Publishers, Jaipur. 2017.

REFERENCE BOOKS:

1. Baluchamy. S. Women's Empowerment of Women. Pointer Publishers, Jaipur. 2010.
2. Khobragade Grishma. Women's Empowerment: Challenges and Strategies Empowering Indian Women, Booksclinic Publishing, Chhattisgarh. 2020.
3. https://www.economicsdiscussion.net/entrepreneurship/women–entrepreneurs–in–india
4. https://www.businessmanagementideas.com/entrepreneurship–2/women–entrepreneurs

II B.Tech. – II Semester

(20BT40205)**RELIABILITY AND SAFETY ENGINEERING**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Differential Equations and Multi-Variable Calculus, and Transformation Techniques and Linear Algebra.

COURSE DESCRIPTION: Fundamentals of reliability engineering; Network modelling and reliability evaluation; Markov chain and Markov processes; basics of safety concepts and safety techniques and applications.

COURSE OUTCOMES: After successful completion of this course, student will be able to:

CO1. Develop mathematical model of a network to evaluate the parameters for assessing the reliability of a system.

CO2. Analyze the time dependent/independent characteristics of a repairable system and frequency durations techniques to assess reliability.

CO3. Understand various safety management, policy, and planning strategies for personal and industrial safety.

CO4. Understand various safety and hazard identification techniques and follow appropriate safety measures in industry and society.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	2	1	1	-	-	-	-	-			
CO2	3	3	-	-	2	1	1	-	-	-	-	-			
CO3	3	-	-	-	2	1	1	1	-	-	-	-			
CO4	3	-	-	-	2	1	1	1	-	-	-	-			
Average	3	2.5	1	-	2	1	1	1	-	-	-	-			
Correlation level	3	3	1	-	2	1	1	1	-	-	-	-			

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT-I: FUNDAMENTALS OF RELIABILITY ENGINEERING (9 periods)

Random variables, probability concepts, rules for probabilities of events. Probability density and distribution functions. Binomial distribution - Expected value and standard deviation for binomial distribution. Reliability functions, f(t), F(t), h(t) - Relationship between these functions, Exponential density and distribution functions, expected value and standard deviation of exponential distribution. Measures of reliability - MTTF, MTTR, MTBF. Bathtub curve.

UNIT-II: NETWORK MODELING AND RELIABILITY EVALUATION (9 periods)

Basic concepts - Evaluation of network reliability/unreliability, series systems, parallel systems, series - Parallel configuration systems. Redundant systems and its types. Evaluation of network Reliability / Unreliability using conditional probability method, tie-set and cut-set based approach, complete event tree and reduced event tree methods.

UNIT-III: MARKOV CHAIN AND MARKOV PROCESSES (9 periods)

Basic concepts, stochastic transitional Probability matrix, time dependent probability evaluation, Limiting State Probability evaluation, Absorbing states. Modelling concepts – State space diagrams, time dependent reliability evaluation of single component repairable model, two component repairable model. Frequency and duration techniques.

UNIT-IV: BASICS OF SAFETY CONCEPTS (9 periods)

Introduction, goals, need for safety, history of safety movement - evolution of modern safety concept, general concepts of safety management. Planning for safety-productivity, quality and safety, line and staff functions, budgeting for safety, safety policy.

UNIT-V: SAFETY TECHNIQUES AND APPLICATIONS (9 periods)

Introduction to safety techniques, Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety. Hazard identification techniques, components of safety audit, types of audit, audit methodology, process of safety reporting. Applications of industrial Safety, environmental safety, health safety, electrical safety, fire safety.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Roy Billintonand Ronald N Allen, *Reliability Evaluation of Engineering Systems*, 2nd edition, Springer, New York, 2013.
2. Frank R. Spellman, Nancy E. Whiting, *Safety Engineering: Principles and Practices*, 3rd edition, Rowman& Littlefield, 2018.

REFERENCE BOOKS:

1. Charles E. Ebeling, *An introduction to reliability and maintainability engineering*, 2nd edition Tata McGraw-Hill Education, 2010.
2. Dan Petersen, *Techniques of Safety Management: A Systems Approach*, 4thedition american society of safety engineers, 2003.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/105/108/105108128/
2. https://nptel.ac.in/courses/110/105/110105094/
3. https://www.youtube.com/watch?v=uutg8jKrL9w
4. https://www.youtube.com/watch?v=_c-iZ2BAXPw
5. https://www.youtube.com/watch?v=GeMCF3s5EDk
6. https://www.youtube.com/watch?v=xYWyype7cxE

II B.Tech. – II Semester

(20BT40105)**ENVIRONMENTAL POLLUTION AND CONTROL**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: --

COURSE DESCRIPTION: Fundamentals of air pollution; Dispersion of pollutants; Effects and control of air pollution; Water pollution; Soil pollution and control; Municipal solid waste management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze air and noise pollution using appropriate tools and techniques to solve complex environmental issues following relevant standards considering society, environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze air and noise pollution control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze water pollution and its control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze soil pollution and its control measures using appropriate tools and techniques to solve complex environmental issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze solid waste and its management measures using appropriate tools and techniques to solve solid waste disposal issues following relevant standards and latest developments considering society, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2	2	2	3	2		1					3
CO2	4	3	3		2	2	2	2	1		1		1			3
CO3	4	3	3		2	2	2	2	1		1		1			3
CO4	4	3	3		2	2	2	2	2		1		1			3
CO5	4	3	3		2	2	2	2	1		1	2	1			3
Average		3	3		2	2	2	2.2	1.4		1	2	1			3
Course		3	3		2	2	2	3	2		1	2	1			3

Correlation Level															

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: AIR AND NOISE POLLUTION (08 Periods)

Air Pollution: Scope, Significance, Classification, Sources – Line, Area, Stationary, Mobile; Effects of air pollutants on man, material and vegetation; Global effects of air pollution; Air pollution meteorology - Lapse rate, Inversion, Plume pattern; Dispersion of air pollutants - Dispersion models and applications; Ambient air quality standards.

Noise Pollution: Sound pressure, Power and intensity, Impacts of noise, permissible limits of noise pollution, measurement of noise, Noise standards.

UNIT – II: AIR AND NOISE POLLUTION CONTROL (10 Periods)

Self cleansing properties of the environment,Dilution method, Control at source, Process changes and equipment modifications, Control of particulates – Types of equipment, Design and operation - Settling chambers, Centrifugal separators, Bag house filters, Wet scrubbers, Electrostatic precipitators; Control of gaseous pollutants – Adsorption, Absorption, Condensation, Combustion; Control of air pollution from automobiles, Control of noise pollution, Case studies, Latest developments in the air and noise pollution control.

UNIT – III: WATER POLLUTION AND CONTROL (10 Periods)

Water pollution – Sources, Causes, Effects; Surface and groundwater quality – Physical, Chemical, Biological; Drinking water quality standards, Water purification – Processes, Engineered systems – Aeration, Solids separation, Settling operations, Coagulation, Softening, Filtration, Disinfection; Wastewater – Sources, Causes, Effects, Treatment process and disposal – Primary, Secondary, Tertiary; Case studies, Latest developments in the water pollution control.

UNIT – IV: SOIL POLLUTION AND CONTROL (08 Periods)

Soil pollutants, Sources of soil pollution, Causes, Effects and control of soil pollution, Diseases caused by soil pollution, Methods to minimize soil pollution, Effective measures to control soil pollution, Soil quality standards, Case studies, Latest developments in the soil pollution control.

UNIT – V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)

Municipal solid waste – Types, Composition and characteristics; Methods of collection and transportation; Methods of disposal – Open dumping, Sanitary landfill, Composting and Incineration; Utilization - 6R Concept, Recovery and recycling and Energy Recovery; Latest developments in solid waste management

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Inc., 1985.
2. Rao, C.S.*Environmental Pollution Control Engineering*, New Age International Pvt. Ltd., 2nd Edition, 2007.
3. Ibrahim A. Mirsa, *Soil Pollution: Origin, Monitoring & Remediation*, Springer, UK, 2nd Edition, 2008.

REFERENCE BOOKS:

1. Rao, M.N. and Rao, H.V.N.,*Air Pollution,* Tata McGraw–Hill Education Pvt. Ltd., 19th Edition, 2010.
2. Daniel Vallero, *Fundamentals of Air Pollution,* Academic Press (Elsevier), 5th Edition, 2014.
3. Khopkar,S.M., *Environmental Pollution Monitoring and Control,* New Age International Pvt. Ltd., 2nd Edition, 2007.
4. Domkundwar, V. M., *Environmental Engineering*, Dhanpat Rai & Co. Pvt. Ltd., New Delhi, 2014.

ADDITIONAL LEARNING RESOURCES:

1. *National Ambient Air Quality Standards*, Central Pollution Control Board, New Delhi.
2. *Specifications for Drinking Water Standards*, IS10500:2012.
3. *Solid Waste Management Rules*, 2016.

II B.Tech. – II Semester

(20BT40106) PLANNING FOR SUSTAINABLE DEVELOPMENT

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: -

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Compare sustainable development theories in national and global context to protect the society and environment.

CO2. Analyze the unforeseen environmental impacts on sustainable development to protect the society and environment.

CO3. Analyze policies and governance for sustainable development considering ethics, economics, society and environment.

CO4. Analyze systems and strategies for sustainable development using appropriate tools and techniques considering ethics, economics, society and environment.

CO5. Analyze the role of media and education in sustainable development using appropriate tools and techniques considering ethics, society and environment besides communicating effectively.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3			1	2	3								3
CO2	4	3	3				3	3								3
CO3	4	3	3				2	1	1			1				3
CO4	4	3	3			1	2	1	1			1				3
CO5	4	2	2			2	2	1	1		2					3

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT–I: SUSTAINABLE DEVELOPMENT (9 Periods)

Definition and concepts of sustainable development, Capitalization of sustainability-National and global context; Sustainable development goals, Emergence and evolution of sustainability and sustainable development, Theories of sustainability, Case studies.

UNIT–II: ENVIRONMENTAL IMPACT (9 Periods)

Climate change – Science, Knowledge and sustainability; Unforeseen environmental impacts on development, Challenges of sustainable development, Centrality of resources in sustainable development, Case studies.

UNIT–III: SUSTAINABLE POLICIES AND GOVERNANCE (9 Periods)

Governance - Democracy and Eco–welfare; Global civil society and world civil politics, Civic environmentalism, Policy responses to sustainable development, Economics of sustainability, Social responsibility in sustainability, National action, ISO 14001: Environmental management system.

UNIT– IV: SUSTAINABLE SYSTEMS AND STRATAGIES (9 Periods)

Need for system innovation, Transition and co–evolution, Theories and methods for sustainable development, Strategies for eco–innovation, Ecological foot print analysis, Socio ecological indicators – Eco labels; Policy programmes for system innovation, Case studies.

UNIT–V: MEDIA AND EDUCATION FOR SUSTAINABILITY (9 Periods)

Role of emerging media, Remarkable design and communication art, Activism and the public interest, Education for sustainability, Participation in decision making, Critical thinking and reflection, Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. John Blewitt, *Understanding Sustainable Development*, Earth Scan Publications Ltd., 3rd Edition, 2018.
2. Jennifer A. Elliot, *An Introduction to Sustainable Development*, Routledge, 4th Edition, 2013.

REFERENCE BOOKS:

1. Peter Rogers, Kazi F Jalal and John A Boyd, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 2008.
2. Simon Dresner, *The Principles of Sustainability*, Earth Scan Publications Ltd., 2nd Edition, 2008.
3. Peter Bartelmus, *Environment Growth and Development: The Concepts and Strategies of Sustainability*, Routledge, 3rd Edition, 2003.
4. Gabriel Moser, Enric Pol, Yvonne Bernard, Mirilia Bonnes, Jose Antonio Corraliza and Maria Vittoria Giuliani, *People Places and Sustainability*, Hogrefe & Huber Publishers, 2nd Edition, 2003.

ADDITIONAL LEARNING RESOURCES:

1. Anil Markandya, *Climate Change and Sustainable Development: Prospects for Developing Countries*, Routledge, 2002.

II B.Tech. – II Semester

(20BT40107)**RURAL TECHNOLOGY**
(Open Elective-1)
(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:--

COURSE DESCRIPTION: Technology forruraldevelopment; Nonconventional energy; Technologies for rural development; Community development; IT in rural development.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Comparevarioustechnologies for rural development by solving rural problems throughdifferent schemes by considering ethics, society, environment and sustainability.

CO2. Analyze non conventional energy sources using appropriate tools and techniques to solve rural energy problems consideringsociety, environment and sustainability besides communicating effectively in graphical form.

CO3. Select appropriate technologiesin different areasofrural development to solve rural issues following latest developments considering society, environment and sustainability.

CO4. Relate water conservation, health, safety and rural employment issues for community development to solve rural problems through appropriate technologies considering ethics, society, environment and sustainability.

CO5. Analyze the impact ofIT,public and private partnershipon rural development to solve complex rural problems using appropriate tools and techniques considering ethics, society, environment and sustainability.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		3	2	1	1	1					3		
CO2	4	2	3		2	2	1	1			1			3		
CO3	5	2	3		2	2	1	1					1	3		
CO4	4	2	3		2	2	1	2	1					3		
CO5	4	2	3		3	2	1	1	1					3		
Average		2	3		2.4	2	1	1.2	1		1		1	3		
Course Correlation Level		2	3		3	2	1	2	1		1		1	3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT–I:TECHNOLOGY FOR RURAL DEVLOPMENT (9 Periods)

India - Technology and rural development, Pre and post independenceperiod,RuralIndia Life, Indian farmer, Role of science and technology in rural development, Rural technology and poverty eradication, Rural business hubs, Technology in improving rural infrastructure, Various organizations related to innovation, Issues of technology transfer - CAPART, NABARD, CSIR, NIF.

UNIT–II: NON CONVENTIONAL ENERGY (9 Periods)

Definition of energy, Types of alternative sources of energy, Sources of non conventional energy – Solar energy: Solar pump in agriculture, Solar dryer, Solar cooker, Solar heater; Biogas, Recycling and management, Wastes conservation, Assessment and production of biomass products and their utilization.

UNIT –III: TECHNOLOGIES FOR RURAL DEVELOPMENT (9 Periods)

Food and agro based technologies, Tissue culture, Nursery, Building and construction technologies, Cultivation and processing of economic plants, Cottage and social industries, Latest developments in rural technologies.

UNIT–IV: COMMUNITY DEVELOPMENT (9 Periods)

Water conservation, Rain water Harvesting, Drinking water Standards and simple treatments used, Environment and Sanitation, Bio fertilizers, Medical and aromatic plants, Employment generating technologies–Apiculture,Pisciculture, Aquaculture.

UNIT – V:IT IN RURAL DEVELOPMENT (9 Periods)

Role of information technology (IT) in rural areas, Impact of IT in rural development, Need and necessity of technology, Corporate social responsibilities, Private sector participation (Activities in different spheres: Employment, Education, Health, Agriculture and service sectors) and SaansadAdarsh Gram Yojana (SAGY), Village adoption schemes.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Prabhath, S. V., and Sita Devi, P. Ch., *Technology and Rural India*, Serials Publications, 1st Edition, 2012.
2. Virdi, M. S.,*Sustainable Rural Technologies*, Daya Publishing House, 2ndEdition 2018.
3. Chakravarthy, R., and Murthy, P. R. S., *Information Technology and Rural Development*, Pacific Book International, 1st Edition, 2012.

REFERENCE BOOKS:

1. Chakravarthy, R., and Murthy, P. R. S., *Information Technology and Rural Development*, Pacific Book International, 1st Edition, 2012.
2. Shivakanth Singh, *Rural Development Policies and Programmes*, Northern Book Centre, 1st Edition, 2002.
3. Katar Singh and Anil Shishodia*, Rural Development: Principles, Policies, and Management,* SAGE Publications India Private Limited, 4thEdition, 2016.
4. Vinayak Reddy,A., YadagiraCharyulu,M., *Rural Development in India: Policies & Initiatives,* New Century Publications, 1st Edition, 2008.

ADDITIONAL LEARNING RESOURCES:

1. Prasad,L. M., *Principles and Practice of Management*, S. Chand & Sons, 9thEdition, 2019.

2. Venkata Reddy, K., *Agriculture and Rural Development - Gandhian Perspective*, Himalaya Publishing House, 1st Edition, 2017.

II B.Tech. – II Semester
(20BT40305) **HUMAN RESOURCE MANAGEMENT**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Introduction to HRM; recruitment, training and Placement, talent management; Basic types of interviews; Components; Compensation and reward administration;Ethics, Employee Relations, and Fair Treatment at Work, Dispute resolution and grievance management, trade unions andtheir role in collective bargaining;

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the knowledge of concepts and perspective on HRM.
CO2. Demonstrate the knowledge of recruitment, placement and talent management.
CO3. Demonstrate the knowledge of training and development.
CO4. Demonstrate the knowledge of compensation and reward administration.
CO5. Demonstrate the knowledge of ethics, and employee relations.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	1													
CO3	3	1													
CO4	3	1									1				
CO5	3	1				1		1							
Average	3	1				1		1			1				
Correlation level	3	1				1		1			1				

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO HUMAN RESOURCE MANAGEMENT (9 Periods)

Importance of Human Resource Management (HRM), Concepts and perspective on HRM, Role of HRM in a competitive business environment, Environment affecting HRM at the enterprise level, The trends shaping HRM, HR metrics and benchmarking, HR accounting, inventory and information systems.

UNIT-II: RECRUITMENT, PLACEMENT, AND TALENT MANAGEMENT (9 Periods)

HR planning and job analysis, Employee testing and selection, Basic types of interviews, Placement, induction and socialization of the employees, Talent acquisition, talent management.

UNIT-III: TRAINING AND DEVELOPMENT (9 Periods)

Employee Orientation/Onboarding, Appraising employee performance and potential evaluation, Techniques for appraising performance, Managing Employee Retention, Engagement, and Careers, Human Resource Development (HRD).

UNIT-IV: COMPENSATION (8 Periods)

Compensation and reward administration, Basic factors in determining pay rates, Job evaluation methods, Pay for Performance and Financial Incentives, Employee benefits and services.

UNIT-V: ENRICHMENT TOPICS IN HRM (10 Periods)

Ethics, Employee Relations, and Fair Treatment at Work, Dispute resolution and grievance management, trade unions andtheir role in collective bargaining, Employee Safety and Health, Global Challenges in HRM, Managing Human Resources in Small and Entrepreneurial Firms, Business environment and workforce adjustments, Creating high performance systems,Innovations in HRM.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Garry Dessler and BijuVarkkey, *Human Resource Management*, Pearson education,16th Edition, 2020.
2. Aswathappa K, *Human Resource Management*, McGraw Hill Education,8th Edition, 2017.

REFERENCE BOOKS:

1. V.S.P Rao, *Human Resource Management*, Taxmann Publications Pvt. Ltd, 2nd Edition 2020.
2. Bohlander George W, Snell Scott, *Principles of Human Resource Management*, Cengage Learning, 16th edition,2013.

II B.Tech. – II Semester

(20BT50506)**ETHICAL HACKING**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: --

COURSE DESCRIPTION: Ethical hacking, Network and computer attacks, Footprinting, Social engineering, Port scanning, System hacking, Sniffers, Denial of service, Hacking web servers, Wireless hacking, Cryptography, Network Protection System.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on the computer security, social engineering and the intent of ethical hacking.
CO2. Select and apply footprinting and port scanning tools to discover vulnerabilities of the computer system.
CO3. Investigate hacking techniques and tools to maintain computer security.
CO4. Analyze cryptosystems and network protection systems for information security and intrusion prevention.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	3	-	3	-	-	-	-			
CO2	3	-	3	-	-	-	-	-	-	-	-	-			
CO3	3	-	3	-	-	-	-	-	-	-	-	-			
CO4	3	2	3	-	-	-	-	-	-	-	-	-			
Average	3	2	3	-	-	-	-	-	-	-	-	-			
Correlation level	3	2	3	-	-	-	-	-	-	-	-	-			

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT- I: ETHICAL HACKING, NETWORK AND COMPUTER ATTACKS (9 Periods)
Introduction to Ethical Hacking*:* The role of security and penetration testers, Penetration-Testing methodologies, What you can and cannot do legally.
Network and Computer Attacks: Malicious software, Trojans, Backdoors, Viruses, and Worms, Protection against malware attacks, Intruder attacks on networks and computers, Addressing physical security.

UNIT –II:-TCP/IP CONCEPTS AND SOCIAL ENGINEERING (9 Periods)
TCP/IP Concepts:Overview of TCP/IP – Application layer, Transport layer, Internet layer; IP addressing – Planning IP address assignments, IPv6 addressing.

Social Engineering:What is social engineering, What are the common types of attacks, Understand insider attacks, Understand identity theft, Describe phishing attacks, Understand online scams, Understand URL obfuscation, Social engineering countermeasures.

UNIT-III: FOOTPRINTING ANDPORT SCANNING (9 Periods)

Footprinting:Using web tools for footprinting, Conducting competitive intelligence, Using domain name system zone transfers.

Port Scanning:Port scanning, Using port scanning tools, Conducting ping sweeps, Understanding scripting.

UNIT-IV: SYSTEM HACKING (9 Periods)

System hacking -Password cracking techniques, Types of passwords, Key loggers and other spyware technologies, Escalating privileges, Root kits, How to hide files, Steganography technologies, How to cover your tracks and evidences; Sniffers - Protocols susceptible to sniffing, Active and passive sniffing, ARP poisoning, Ethereal capture and display filters, MAC flooding, DNS spoofing techniques, Sniffing countermeasures; Denial of Service - Types of DoS attacks, How DDoS attacks work, How BOTs/BOTNETs work, Smurf attack, SYN flooding, DoS/DDoS counter measures; Session hijacking - Spoofing vs. hijacking, Types of session hijacking, Sequence prediction, Steps in performing session hijacking, Preventing session hijacking.

UNIT-V: CRYPTOGRAPHY, NETWORK PROTECTION SYSTEMS (9 Periods)

Cryptography:Understanding Cryptography basics, Symmetric and asymmetric algorithms, Public key infrastructure, Cryptography attacks.

Network Protection Systems:Understanding routers, Firewalls, Honeypots.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, James E. Corley, *Hands-On Ethical Hacking and Network Defense*, 3rdEdition, Cengage Learning, 2017.
2. Kimberly Graves, *CEH: Official Certified Ethical Hacker Review Guide*, Wiley, 2007.

REFERENCE BOOK:

1. Michael Gregg, *Certified Ethical Hacker (CEH) Cert guide*,3rdEdition, Pearson, 2019.

II B.Tech. – II Semester

(20BT51205)**AI IN HEALTHCARE**

(Open Elective-1)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Concepts ofArtificial Intelligence (AI) in Healthcare; The Present State and Future of AI in Healthcare Specialties;The Role of Major Corporations in AI in Healthcare;Applications of AI in Healthcare.

COURSE OUTCOMES: Aftersuccessful completion of the course, students will be able to:

CO1. Understand the fundamental concepts of AI in Healthcare sector.
CO2. Analyze the present state and future of AI in Healthcare specialties for different scenarios.
CO3. Apply design concepts and metrics for AI in Healthcare.
CO4. Demonstrate basic concepts and terminologies of future applications of Healthcare in AI.
CO5. Develop AI applications through AI techniques for healthcare.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-	-			
CO2	2	3	-	2	-	2	2	-	-	-	-	-			
CO3	2	-	2	2	-	-	-	-	-	-	-	-			
CO4	2	-	-	-	2	2	-	-	-	-	-	-			
CO5	2	-	-	-	2	2	-	-	-	-	-	-			
Average	2	2	2	2	2	2	2	-	-	-	-	-			
Correlation level	2	2	2	2	2	2	2	-	-	-	-	-			

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE IN HEALTHCARE (8 periods)

Introduction to AI in Healthcare, Benefits and Risks, AI in the health sector, AI versus Human Intelligence, The future of AI in health sector, AI and Neural networks.

UNIT-II:THE PRESENT STATE AND FUTURE OF AI IN HEALTHCARE SPECIALTIES (10 periods)

Artificial Intelligence in: preventive healthcare, Radiology, Pathology, Surgery, Anesthesiology, Psychiatry, Cardiology, Pharmacy, Dermatology, Dentistry, Orthopedics, Ophthalmology.

UNIT-III: THE ROLE OF MAJOR CORPORATIONS IN AI IN HEALTHCARE **(8 periods)**

IBM Watson, The role of Google and Deep mind in AI in Healthcare, Baidu, Facebook and AI in Healthcare, Microsoft and AI in Healthcare.

UNIT-IV:FUTURE OF HEALTHCARE IN AI (10 periods)

Evidence-based medicine, personalized medicine, Connected medicine,Disease and Condition Management , Virtual Assistants, Remote Monitoring, Medication Adherence, Accessible Diagnostic Tests, Smart Implantables, Digital Health and Therapeutics, Education, Incentivized Wellness.Artificial Intelligence, Block chain, Robots, Robot-Assisted Surgery, Exoskeletons, Inpatient Care, Companions, Drones, Smart Places, Smart Homes, Smart Hospitals, Reductionism, Innovation vs. Deliberation.

UNIT-V:APPLICATIONS OF AI IN HEALTHCARE (9 periods)

Case Study 1: AI for Imaging of Diabetic Foot Concerns and Prioritization of Referral for Improvements in Morbidity and Mortality.

Case Study2: Outcomes of a Digitally Delivered, Low-Carbohydrate, Type 2 Diabetes Self-Management.

Case Study3: Delivering a Scalable and Engaging Digital Therapy.

Case Study4: Improving Learning Outcomes for Junior Doctors through the Novel Use of Augmented and Virtual Reality for Epilepsy

Case Study5: Big Data, Big Impact, Big Ethics-Diagnosing DiseaseRisk from Patient Data.

Total Periods: 45

Topics for self-study shall be included in lesson plan.

TEXT BOOKS:

1. Dr.Parag Mahajan, *Artificial Intelligence in Healthcare, MedManthra Publications*, First Edition 2019.
2. *Arjun Panesar, Machine Learning and AI for Healthcare Big Data for Improved Health*, Apress Publications, 2019.

REFERENCE BOOKS:

1. Michael Matheny, SonooThadaneyIsrani, Mahnoor Ahmed, and DanielleWhicher,*Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril*, National Academy of Medicine Publication, First Edition, 2019.

ADDITIONAL LEARNING RESOURCES:

1. https://www.udacity.com/course/ai-for-healthcare-nanodegree--nd320 (AI for Healthcare).
2. https://builtin.com/artificial-intelligence/artificial-intelligence-healthcare(Surgical robots, new medicines and better care: 32 examples of AI in healthcare).
3. https://healthtechmagazine.net/article/2020/02/future-artificial-intelligence-healthcare (Future of Artificial Intelligence in Healthcare).

II B.Tech. – II Semester

(20BT51501)**BIOINFORMATICS**

(Open Elective-1)
(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Biological Data Acquisition, Databases, Data Processing, Methods of Analysis, Applications of Bio-informatics

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand basic biological data acquisition in bioinformatics.
CO2. Identify the proper databases for the information search by choosing the biological databases and also submission and retrieval of data from databases.
CO3. Analyze the results of bioinformatics data using text and sequence-based searching techniques.
CO4. Analyze the secondary and tertiary structures of proteins by applying different alignment programs
CO5. Design biological databases and novel drugs by using contextual knowledge on bioinformatics.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	3	3	-	-	-	-	-	-	-	-	-	-			
CO3	3	3	2	-	3	-	-	-	-	-	-	-			
CO4	3	3	2	-	3	-	-	-	-	-	-	-			
CO5	3	2	3	2	2	-	-	-	-	-	-	-			
Average	3	2.5	2.3	2	2.6	-	-	-	-	-	-	-			
Correlation level	3	3	3	2	3	-	-	-	-	-	-	-			

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: BIOLOGICAL DATA ACQUISITION (9 Periods)

Biological information, Retrieval methods for DNA sequence, protein sequence and protein structure information

UNIT-II: DATABASES **(9 Periods)**

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary and secondary sequence databases, protein sequence and structure databases.

UNIT-III: DATA PROCESSING **(9 Periods)**

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local and global. Distance metrics. Similarity and homology. Scoring matrices, PAM and BLOSUM

UNIT-IV: METHODS OF ANALYSIS **(9 Periods)**

Dynamic programming algorithms, Needleman-Wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA and BLAST; Multiple Sequence Alignment and software tools for pair wise and multiple sequence alignment, CLUSTAL program, Prediction of Tertiary structure of proteins.

UNIT-V: APPLICATIONS **(9 Periods)**

Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis, Genomics, Proteomics, Genome analysis – Genome annotation, DNA Microarray, computer aided drug design (CADD).

Total Periods: 45

Topics for Self-Study are provided in Lesson Plan

TEXT BOOKS:

1. Lesk, A. K., "*Introduction to Bioinformatics*" 4th Edition, Oxford University Press, 2013
2. Dan Gusfield, "*Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology*" Cambridge University Press, 1997.

REFERENCE BOOKS:

1. Baldi, P. and Brunak, S., "*Bioinformatics: The Machine Learning Approach*" 2nd Edition, MIT Press. 2001
2. Mount, D.W., "*Bioinformatics Sequence and Genome Analysis*" 2nd Edition, Cold Spring Harbor Laboratory Press, 2004
3. Tindall, J., "*Beginning Perl for Bioinformatics: An introduction to Perl for Biologists*" 1st Edition, O'Reilly Media, 2001

II B.Tech. - II Semester

(20BT40131)**ENVIRONMENTAL ENGINEERING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PREREQUISITES: Course onEnvironmental Engineering.

COURSE DESCRIPTION: Experimentalanalysis ofphysical, chemical and biological parametersof water and wastewater; Analysis of an ambient air quality.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluate water using various tools and techniques to solve complex water problems by following the standard procedures/norms and latest developments ensuring safety, environment and sustainability.

CO2. Evaluate wastewater using various tools and techniques to solve complex wastewater problems by following the standard procedures/norms and latest developments ensuring safety, environment and sustainability.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on water supply and wastewater engineering.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	3	3		2	2	2	2	1				2			3
CO2	5	3	3		2	2	2	2	1				2			3
CO3	3									3	2					3
Average		3	3		2	2	2	2	1	3	2		2			3
Course Correlation Level		3	3		2	2	2	2	1	3	2		2			3

Correlation Levels: 3: High 2: Medium 1: Low

LIST OF EXPERIMENTS:

1. Determination of pH, electrical conductivity and TDSof a given water sample
2. Determination of alkalinity and acidity of a given water sample
3. Determination of total solids, volatile and fixed solids of a given water sample
4. Determination of chlorides of a given water sample
5. Determination of iron and fluoride content of a given water sample
6. Determination of residual chlorine of a given chlorinated water sample
7. Determination of turbidity and optimum coagulant dose of a given water sample
8. Determination of dissolved oxygen and BOD of a given wastewater sample
9. Determination of COD of a given wastewater sample
10. Determination of nitrate nitrogen as $NO_3$of a given wastewater sample
11. Determination of sulphates as SO_4 of a given wastewater sample
12. Determination of phosphates as PO_4 of a given wastewater sample

13. Determination of color of a given water or wastewater sample
14. Bacterial examination of a given water or wastewater sample (not for examination)
15. Determination of air pollutants of an ambient air (not for examination)

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Environmental Engineering Lab Manual (SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

II B.Tech.–II Semester

(20BT40132) GEOTECHNICAL ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	–	–	3	1.5

PREREQUISITES: Course onSoil Mechanics.

COURSE DESCRIPTION: Experiments on the determination of index properties and engineering properties of soil.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluate index properties of soil using appropriate tools and techniques to solve complex soil engineering problems by following the relevant codes of practice and through continuous learning ensuring safety and environment.

CO2. Evaluate engineering properties of soil using appropriate tools and techniques to solve complex soil engineering problems by following the relevant codes of practice and through continuous learning ensuring safety and environment.

CO3. Perform individually or in a team besides continuous learning and communicating effectively in written, oral and graphical forms on civil engineering materials and construction technology.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	3	3		2	2	1	1	2				1		3	
CO2	5	3	3		2	2	1	1	2				1		3	
CO3	4									3	3		1		3	
Average		3	3		2	2	1	1	2	3	3		1		3	
Course Correlation Level		3	3		2	2	1	1	2	3	3		1		3	

Correlation Levels: 3: H - High 2: M - Medium 1: L - Low

LIST OF EXPERIMENTS:

A. INDEX PROPERTIES OF SOIL

1. Determination of water content
2. Determination of specific gravity
3. Grain size analysis – sieve analysis and hydrometer analysis
4. Tests for Atterberg's limits
   (a) Determination of liquid limit – Casagrande's method and cone penetrometer method
   (b) Determination of plastic limit
   (c) Determination of shrinkage limit
5. Determination of field density – core cutter method and sand replacementmethod
6. Relative density test

B. ENGINEERING PROPERTIESOF SOIL

1. Standard Proctor's compaction test
2. CBR Test
3. Permeability of soil – constant head test and variable head test
4. Consolidation test
5. Direct shear test
6. Unconfined compression test
7. Tri–axial compression test
8. Vane shear test

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Geotechnical Engineering Laboratory Manual (SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

II B. Tech. – II Semester

(20BT40133) **STRENGTH OF MATERIALS LAB**

(Common to CE and ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Course on Mechanics of Solids/Strength of Materials.

COURSE DESCRIPTION: Tests on strength of materials**:** Tension test; Compression test; Bending test; Shear test; Torsion test; Hardness test; Verification of Maxwell reciprocal theorem.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluatethe strength of materials such as steel, timber, metal using appropriate tools/techniques to solve complex problems in accordance with codal provisions ensuring safety.

CO2. Evaluate the load-deflection behavior for the materials used in beams and springsusing appropriate tools/techniques to solve complex problems in accordance with codal provisions ensuring safety.

CO3. Perform material testing individually or in a team besides communicating effectively in written, oral and graphical forms on strength of materials.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	2	3		1	3	1		2					3		
CO2	5	2	3		1	3	1		2					3		
CO3	4									3	3			2		
Average		2	3		1	3	1		2	3	3			2.67		
Course Correlation Level		2	3		1	3	1		2	3	3			3		

Correlation Levels: 3: H – High 2: M – Medium 1: L – Low

LIST OF EXPERIMENTS:

1. Tension test on mild steel/HYSD bar
2. Compression test on wood/bricks/mild steel
3. Compression test on coiled spring
4. Tension test on coiled spring
5. Bending test on carriage spring
6. Brinell and Rockwell hardness tests
7. Charpy and Izod impact tests
8. Shear test on mild steel
9. Bending test on simply supported beam
10. Bending test on cantilever beam
11. Bending test on fixed beam
12. Bending test on continuous beam

13. Bending test on overhanging beam
14. Verification of Maxwell's reciprocal theorem
15. Torsion test on mild steel

Note: Minimum 12 experiments shall be conducted.

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Strength of Materials Lab Manual (SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

II B.Tech. – II Semester

(20BT40134) **ADVANCED SURVEYING PRACTICE**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	1	2	2

PRE-REQUISITES: Course on Surveying.

COURSE DESCRIPTION: Exercises on:Total station surveying; Drone surveying.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Develop survey plots and 3D models using total station and appropriate software tools and techniques to solve complex surveying problems following ethics and latest developments considering society, environment and sustainability.

CO2. Develop survey plots and 3D models using drone and appropriate software tools and techniques to solve complex surveying problems following ethics and latest developments considering society, environment and sustainability.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on advanced surveying practice.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	3	3	3	3	3	2	1	1				1			3
CO2	6	3	3	3	3	3	2	1	1				1			3
CO3	4									3	3					2
Average		3.00	3.00	3.00	3.00	3.00	2.00	1.00	1.00	3.00	3.00		1.00			2.67
Course Correlation Level		3	3	3	3	3	2	1	1	3	3		1			3

Correlation Levels: 3 - High 2 – Medium 1 – Low

LIST OF PRACTICAL EXERCISES:

PART – I: TOTAL STATION SURVEYING

1. Basic operations of total station - centering, leveling, measuring distances, measuring angles.
2. Boundary survey and contour mapping in a layout using total station
3. Boundary survey data processing for preparation of the layout using AutoCAD
4. Generation of coordinates in AutoCAD for developing new plots within the establishedboundaries in the layout
5. Import the coordinates of the new plots generated to total station and marking them in the field
6. Measurment of areas and volumes using total station
7. Generation of 3D models of designed layouts using relevant software tools

PART- II: DRONE SURVEYING

1. Introduction to professional drone
2. Flying the professional drone in the field
3. Downloadingsurvey data from the drone
4. Geo-referencing the drone images
5. Processing drone survey data to create orthomosaic maps (3D Maps) using data processing software tools
6. Determination of area using drone
7. Determination of volume using drone
8. Digital Surface Modeling (DSM) and Digital Terrain Modelling (DTM) using drone.
9. Infrastructure quality inspection using drone
10. Construction site monitoring using drone

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Advanced Surveying Practice Manual (SVEC20 Regulations)*, Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.
2. Satheesh,G., Sathikumar, R. and Madhu, N., *Advanced Surveying:Total Station, GPS, GIS & Remote Sensing,*Pearson, 2nd Edition, 2017.
3. Kike Calvo, *So You Want to Create Maps Using Drones?,* Blurb Publishers, 2015.
4. Armenakis, C. and Patias, P., *Unmanned Vehicle Systems for Geomatics: Towards Robotic Mapping*, Whittles Publishing, 2019.

II B. Tech. - II Semester

(20BT315AC)**DESIGN THINKING**

(Audit Course)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

PRE-REQUISITES: -

COURSE DESCRIPTION: Design thinking process, Design thinking phases, empathy tools; Idea generation, visualizing and empathizing; Fidelity for prototypes, prototyping; prototyping for physical products.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze design thinking concepts and principles to perform human centered design process for creative problem solving.
CO2. Create empathy maps to visualize user attitudes and behavior for gaining insights of customers.
CO3. Develop innovative products or services for a customer base using ideation techniques.
CO4. Build prototypes for complex problems using gathered user requirements.
CO5. Apply design thinking tools techniques to produce good design and relevant products or services for a specific target market.
CO6. Improve prototype by testing it with a specific set of users for making it sustainable by following ethics.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	3	2	-	-	-	-	-	-	-	-			
CO2	1	3	-	-	-	-	-	-	-	-	-	-			
CO3	1	-	-	3	1	-	-	-	-	-	-	-			
CO4	-	3	-	3	-	-	-	-	-	-	-	-			
CO5	-	-	-	-	1	2	3	-	-	-	-	-			
CO6	1	3	1	-	-	-	1	1	-	-	-	-			
Average	1	3	2	2.6	1	2	2	1	-	-	-	-			
Correlation level	1	3	2	3	1	2	2	1	-	-	-	-			

Correlation Levels: 3 - High 2 – Medium 1 – Low

DETAILED SYLLABUS:

UNIT-I:INTRODUCTION TO DESIGN THINKING (6 Periods)

Design Thinking Process: Types of the thinking process, Common methods to change the human thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Problem solving, Understanding design thinking and its process model, Design thinking tools.

UNIT-II: EMPATHIZE (6 Periods)

Design thinking phases, How to empathize, Role of empathy in design thinking, purpose

of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools : Customer Journey Map, Personas.

UNIT-III:IDEATION (6 Periods)

Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method**,** Ideation Tools: How Might We? (HMW), Story board, Brainstorming.

UNIT-IV:PROTOTYPING (6 Periods)

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype

UNIT-V:TESTING PROTOTYPES (6 Periods)

Prototyping for digital products: What's unique for digital, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.

Total Periods: 30

Topics for Self-Study are provided in Lesson Plan

TEXTBOOK:

1. S.Salivahanan, S.Suresh Kumar, D.Praveen Sam,"Introduction to Design Thinking",TataMcGraw Hill, First Edition,2019.
2. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly,2017.

REFERENCE BOOKS

1. Michael G. Luchs, Scott Swan , Abbie Griffin,"*Design Thinking – New Product* Essentials *from PDMA*", Wiley, 2015.
2. Vijay Kumar, "*101 Design Methods: A Structured Approach for Driving Innovation in Your Organization*", 2012.

ADDITIONAL LEARNING RESOURCES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
2. https://www.ibm.com/design/thinking/page/toolkit
3. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge-by-creating-your-point-of-view-and-ask-how-might-we
4. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
5. https://nptel.ac.in/courses/109/104/109104109/
6. https://nptel.ac.in/courses/110106124/

III B. Tech. – I Semester

(20BT50101) **FOUNDATION ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Soil Mechanics.

COURSE DESCRIPTION: Soil exploration; Lateral earth pressure; Earth retaining structures; Stability of earth slopes; Bearing capacity of shallow foundations; Pile foundations, Caissons and well foundations.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze soil exploration to solve complex foundation engineering problems using appropriate tools and techniques by following the relevant codes of practice and through continuous learning ensuring safety, environment and cost effectiveness besides communicating effectively in graphical form.

CO2. Analyze lateral earth pressures to solve complex foundation engineering problems using appropriate techniques ensuring safety and environment besides communicating effectively in graphical form.

CO3. Analyze stability of earth slopes to solve complex slope stability problems using appropriate techniques by following the relevant codes of practice and ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO4. Design shallow foundations to solve complex foundation engineering problems using appropriate techniques by following the relevant codes of practice and ensuring safety and environment besides communicating effectively in graphical form.

CO5. Design pile foundations; well and caisson foundations to solve complex foundation engineering problems using appropriate techniques by following the relevant codes of practice and ensuring safety and environment besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3	-	2	2	1	1	2	-	1	1	1	-	3	-
CO2	4	2	3	-	2	2	1	1	2	-	2	-	1	-	3	-
CO3	4	2	3	-	2	2	1	1	2	-	1	-	1	-	3	-
CO4	6	2	3	3	2	2	1	1	2	-	1	-	1	-	3	-
CO5	6	1	2	3	2	2	1	1	2	-	1	-	1	-	3	-
Average		1.8	2.8	3	2	2	1	1	2	-	1.2	1	1	-	3	-
Course Correlation Level		2	3	3	2	2	1	1	2	-	2	1	1	-	3	-

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: SOIL EXPLORATION (09 Periods)

Need, Planning, Methods of soil exploration- Geophysical methods, Open excavation methods, Boring and sampling methods; Types of soil samples, Field tests- SPT, CPT, Plate load test, In–situ vane shear test; Borehole logging, Soil investigation report, Latest methods.

UNIT – II: LATERAL EARTH PRESSURE (09 Periods)

Types of earth pressures, Plastic equilibrium in soils, Rankine's theory - Earth pressures in cohesionless and cohesive soils; Coulomb's wedge theory, Earth pressure on retaining walls of simple configurations, Graphical methods (Rebhann and Culmann), Types of earth retaining structures, Stability considerations of gravity and cantilever retaining walls.

UNIT – III: STABILITY OF EARTH SLOPES (08 Periods)

Infinite and finite earth slopes, Types of failures, Factor of safety of infinite slopes, Stability analysis of finite slopes, Bishop's simplified method, Taylor's stability number, Stability of slopes of earth dams under different conditions,Improving stability of slopes.

UNIT- IV: BEARING CAPACITY OF SHALLOW FOUNDATIONS (10Periods)

Types and choice of foundation, Depth of foundation, Types of shear failure, Safe bearing capacity, Bearing capacity theories- Terzaghi, Meyerhof, Skempton and IS methods; Effect of groundwater table on bearing capacity, Bearing capacity from SPT and CPT, Allowable bearing pressure, Safe bearing capacity and settlement from plate load test, Allowable settlements of structures, Settlement analysis.

UNIT – V: PILE FOUNDATIONS, **CAISSONS AND WELL FOUNDATIONS**

(09 Periods)

Pile Foundations: Types of pile foundations, Factors influencing the selection of pile, Load carrying capacity of piles in granular and cohesive soils, Static and dynamic pile formulae, Pile load test, Negative skin friction, Load carrying capacity of pile groups in sands and clays, Settlement of pile groups, Design of piles and pile groups.

Caissons and Well Foundations:Types of caissons, Bearing capacity, Construction,Advantages and disadvantages, Well foundations - Shapes, Components, Sinking, Tilts and shifts.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Venkataramaiah, C.,*Geotechnical Engineering*, New Age International Publishers, 3rd Edition, 2010.
2. Arora,K. R.,*Soil Mechanics and Foundation Engineering*, Standard Publishers and Distributors, 7th Edition, 2010.

REFERENCE BOOKS:

1. Punmia,B. C., Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundations*, Laxmi Publications, 16th Edition, 2005.
2. Gopal Ranjan and Rao, A. S. R.,*Basic and Applied Soil Mechanics,* New Age International, 2nd Revised Edition, 2010.
3. Braja M. Das, *Principles of Foundation Engineering,* Cengage Learning India, 6th Edition, 2007.
4. Bowles, J. E., *Foundation Analysis and Design,*McGraw–Hill Publishing Company, 5th Edition, 2001.

ADDITIONAL LEARNING RESOURCES:

1. Das, B. M., *Advanced Soil Mechanics,* CRC Press, 5th Edition, 2019.
2. Murthy, V. N. S., *Advanced Foundation Engineering,* CBS Publisher, 4th Edition, 2017.

IS CODES:

IS 6403 - 1981	:	Determination of Bearing Capacity for Shallow Foundations.
IS 2911 – 2010	:	Design and Construction of Pile Foundations.
IS 1080 – 1985	:	Design and Construction of Shallow Foundations in Soils (other than Raft, Ring and Shell).
IS 1892 – 1979	:	Subsurface Investigation of Shallow Foundations in Soils.

III B.Tech. – I Semester

(20BT50102) REINFORCED CEMENT CONCRETE STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Civil Engineering Materials and Construction Technology, Engineering Mechanics, Mechanics of Solids, Structural Analysis.

COURSE DESCRIPTION: Design of reinforced cement concrete structural elements:Beams (Working stress and limit state methods);Shear, torsion and bond; Slabs; Columns; Shallow footings and stair cases.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design of beams for flexure to solve complex problems related to reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.
CO2. Design of beams for shear, torsion and bond to solve complex problems associated with reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.
CO3. Design of slabs to solve complex problems related to reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.
CO4. Design of columns to solve complex problems associated with reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety, stability and serviceabilitybesides communicating effectively through schematic detailing.
CO5. Design footings and staircases to solve complex problems associated with reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	6	1	2	3	3	2	2		2		1			3		
CO2	6	1	2	3	3	2	2		2		1			3		
CO3	6	1	2	3	3	2	2		2		1			3		
CO4	6	1	2	3	3	2	2		2		1			3		
CO5	6	1	2	3	3	2	2		2		1			3		
Average		1	2	3	3	2	2		2		1			3		
Correlation Levels		1	2	3	3	2	2		2		1			3		

Correlation Levels: 3 – High 2– Medium 1 - Low

DETAILED SYLLABUS:

UNIT - I: BEAMS (09 Periods)

Beams (Working Stress Method): Methods of design used in reinforced concrete structural elements, Behaviour of RCC beam in bending, Concept of working stress method, Design of singly reinforced rectangular beams for bending.

Beams (Limit State Method):Concept of limit state method, Design of simply supportedsingly and doubly reinforced beams for flexure - Rectangular, T and L beams.

UNIT - II: SHEAR, TORSION AND BOND (08 Periods)

Limit state analysis and design of section for shear and torsion; Concept of bond, anchorage and development length; I.S. code provisions, Design of simply supported and continuous beams - Detailing; Limit state design for serviceability for deflection, cracking and codal provision.

UNIT - III: SLABS (LIMIT STATE METHOD) (08 Periods)

Limit state design of one way, two way and continuous slabs.

UNIT - IV: COLUMNS (LIMIT STATE METHOD) (08 Periods)

Design of axially and eccentrically loaded short and long column.

UNIT - V: SHALLOW FOOTINGS AND STAIRCASES (LIMIT STATE METHOD) (12 Periods)

Shallow Footings:Design of isolated square and rectangular footings for axially and eccentrically loaded columns, Design of combined footing.

Staircases:Types of staircases, Stairs spanning longitudinally and transversally.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Unnikrishna Pillai, S., and Devdas Menon, *Reinforced Concrete Design,* Tata Mc. Graw Hill, 3rd Edition, 2016.
2. Krishna Raju, N. and Pranesh, R. N.,*Reinforced Concrete Design*, CBS Publishers Distributors, 4thEdition, 2016.

REFERENCE BOOKS

1. Varghese, P. C., Limit *State Designed of Reinforced Concrete*, Prentice Hall of India, 2nd Edition, 2010.
2. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *Reinforced Concrete Structures – Vol. I*, Laxmi Publications Pvt. Ltd., 7th Edition, 2013.
3. Roy, S. K., and Sinha, N.,*Fundamentals of Reinforced Concrete,* S. Chand & Company Ltd., 6th Edition, 2013.
4. Gambhir, M. L., *Fundamentals of Reinforced Concrete Design,* Printice Hall of India Pvt. Ltd., 2010.

ADDITIONAL LEARNING RESOURCES

1. Park and Paulay, *Reinforced Concrete Structures*, Willey Publishers, 1975.
2. Arthus Nilson, H., David Darwin, and Chorles W., *Design of Concrete Structures*, Tata Mc. Graw-Hill, 3rd Edition, 2005.
3. Karve, S. R., and Shah, V. R., *Limit State Theory and Design of Reinforced Concrete*, Standard Publishers, Pune, 3rd Edition, 1994.

CODES

IS 456 - 2000 : Plan and Reinforced Concrete – Code of Practice
SP 16 – 1980 : Design Aids for Reinforced Concrete to IS 456
SP 34 - 1987 : Concrete Reinforcement and Detailing
IS 875 – 2015 : Design Loads and Structures
IS1893 – 2016 : Earthquake Resistant Design
IS 4326 – 2013 : Earthquake Resistant Design and Construction of Buildings
IS 13920 – 2016 :Ductile Detailing of Framed Structures

III B. Tech. – I Semester

(20BT50103)**TRANSPORTATION ENGINEERING**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Surveying, Soil Mechanics

COURSE DESCRIPTION: Highway development and planning; Highway geometric design; Pavement materials; Pavement design; Traffic engineering; Railway engineering; Airport engineering.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze highway development, planning and highway materials to solve complex highway engineering problems using appropriate tools and techniques following relevant codes considering society and environment besides communicating effectively in graphical form.

CO2. Design highway, railway and airport geometric features to solve complex highway, railway and airport engineering problems using appropriate techniques and following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Design bituminous mix and pavements to solve complex highway and airport engineering problems using appropriate techniques and following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze traffic to solve complex traffic engineering problems using appropriate tools and techniques following relevant codes and latest developments considering society and environment.

CO5. Analyze various components of railways to solve complex railway engineering problems using appropriate tools and techniques considering society and environment besides communicating effectively in graphical form.

CO6. Analyze various components of airports to solve complex airport engineering problems using appropriate tools and techniques considering society and environment besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3	-	1	1	2	1	1	-	1	-	-	-	3	-
CO2	6	2	2	3	2	1	2	1	1	-	1	-	-	-	3	-
CO3	6	2	2	3	2	2	1	1	2	-	1	-	-	-	3	-
CO4	4	2	3	-	1	1	2	1	1	-	-	-	1	-	3	-
CO5	4	2	3	-	1	1	1	1	-	-	2	-	-	-	3	-
CO6	4	2	3	-	1	1	1	1	-	-	2	-	-	-	3	-
Average		2.00	2.67	3.00	1.33	1.17	1.50	1.00	1.25	-	1.17	-	1.00	-	3.00	-
Course Correlation Level		2	3	3	2	2	2	1	2	-	2	-	1	-	3	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: HIGHWAY DEVELOPMENT, PLANNING AND GEOMETRICDESIGN (9 Periods)

Highway Development and Planning:Highway development in India; Highway planning; Different road development plans; Classification of roads; Road network patterns; Highway alignment – Factors affecting, Engineering surveys, Drawings and reports.

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

UNIT-II: PAVEMENT MATERIALS AND DESIGN (9 Periods)

Pavement Materials:Soil, Aggregates and bitumen –Desirable properties; Tests on subgrade soil – CBR test, Tests on aggregate and bitumen; Aggregate-bitumen mixes – Desirable properties, Mix design by Marshal method; Cement and cement concrete.

Pavement Design:Pavements – Types, Functions and components; Design factors; Flexible pavement design methods – G.I., CBR and Triaxial method; Design of rigid pavements - Critical load positions, Westergaard'sstress analysis, Computing radius of relative stiffness and equivalentradius of resisting section, Stresses in rigid pavements, Design ofexpansion and contraction joints in CC pavements, Design of dowel barsand tie bars.

UNIT-III: TRAFFIC ENGINEERING (9 Periods)

Significance and scope, Characteristics of road users – Driver and vehicle characteristics, Skid resistance and braking efficiency; Components of traffic engineering - Road, Traffic and land use characteristics, Basic characteristics of traffic – Human characteristics, Vehicle characteristics; Traffic parameters and their studies - Volume, Speed and density, Latest trends; Highway Capacity – Definition, Importance and Factors; Levels of service – Concept, Types; Concept of service volume.

UNIT-IV: RAILWAY ENGINEERING (9 Periods)

General features of Indian railways; Route alignment surveys - Conventional and modern methods; Gauges – types, choice of gauge; Permanent way – cross section, components, functions, coning of wheels; Rails - Rail joints,Welding of rails, Creep of rails, Sleeping – Types, Density and spacing, Adzing of sleepers; Ballast; Subgrade; Track geometric design; Points and crossings; Signaling and interlocking.

UNIT-V: AIRPORT ENGINEERING (9 Periods)

Aircraft characteristics; Planning and site selection; Obstruction criteria; Air traffic control; Runways - orientation, length, design of geometric features, capacity, configuration; Taxiways -design of geometric features, fillets, high speed exit taxiway; Taxiways -design of geometric features, fillets, high speed exit taxiway; Terminal building - functional areas and facilities; Visual aids; Airport drainage.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Khanna, K. and Justo, C. E. G., *Highway Engineering,* Nem Chand & Bros, Roorkee, 10th Edition, 2014.
2. Chandra, S. and Agarwal, M.M., *Railway Engineering*, Oxford University Press, New Delhi, India, 2nd Edition, 2013.
3. Khanna, S. K. and Arora, M. G., *Airport Planning and Design*, Nem Chand & Bros., 6th Edition, 2017.

REFERENCE BOOKS:

1. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Technical Publications, Delhi, 7th Edition, 2010.
2. JotinKhisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction,*Prentice Hall of India Pvt. Ltd., 3rd Edition, 2016.
3. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.
4. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning,* Prentice Hall of India Pvt. Ltd.,3rd Edition, 2009.
5. Mannering, F. L. AndWashburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley& Sons, Inc., 5th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Yang H. Huang, *Pavement Analysis and Design*, Pearson Prentice Hall, 2nd Edition, 2004.
2. Nicholas J. Garber and Lester A. Hoel, *Traffic and Highway Engineering*, Cengage Learning, 4th Edition, 2009.

CODES:

IRC 37 – 2018 : Design of Flexible Pavements
IRC 58 – 2015 : Design of Rigid Pavements
IS2386-1963 (Part I to IV) : Methods of Test for Aggregates for Concrete

III B.Tech. – I Semester

(20BT4HS01) **BANKING AND INSURANCE**
(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITE: --

COURSE DESCRIPTION: Introduction to Banking; Bank-Customer Relationship; Electronic Payment System and Business Models; Introduction To Risk And Insurance; Insurance Overview.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the importance of Banking and functions of Reserve Bank of India and its role insustainable development of the country.
CO2. Demonstrate the role, relationships and operations between Banker and Customer.
CO3. Demonstrate the online Banking system, various types of Electronic Payments and Business models.
CO4. Demonstrate concept of risk and principles, functions, types of Insurancecompanies.

Mapping of COs with POs

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	-	-	-	-	-	-	-	-	2	-
Course correlation levels	3	-	-	-	-	-	-	-	-	-	2	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I:INTRODUCTION TO BANKING (9 periods)

Meaning - Importance of banking- Functions of banking - **Reserve Bank of India**: Functions – Role of RBI in sustainable development.

UNIT–II:BANK-CUSTOMER RELATIONSHIP (9 periods)

Debtor-creditor relationship, deposit products or services, payment and collection of cheques. Accounts – Types of accounts, procedure for opening and closing an account - Loans and Advances- principles of lending.

UNIT–III:ELECTRONIC PAYMENT SYSTEM&BUSINESS MODELS (9 periods)

Introduction to Online Banking - types of e-payment system, e-cash,NEFT,RTGS, Credit cards, Electronic Wallet and Debit cards.**Business models**- B2B, B2C, C2C, and B2G.

UNIT–IV:INTRODUCTION TO RISK AND INSURANCE (9 periods)

Concept of risk, risk *Vs* uncertainty. **Insurance**: Definition, Insurance as risk mitigation mechanism, elements of insurance.

UNIT–V:INSURANCE OVERVIEW (9 periods)

Principles of insurance - insurance types - LIC & GIC – insurancefunctions, IRDA - Insurance Players in India.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. RanganadhaChary,A.V. and Paul, R.R., *Banking and Financial system*, Kalyani Publisher, NewDelhi, 3rdedition, 2016.
2. Sharma,R.K., Shashi K. Gupta and Jagwant Singh, *Banking and Insurance*, KalyaniPublishers, New Delhi, 17th edition, 2014.

REFERENCES BOOKS:

1. *Indian Institute of Banking & Finance, Digital Banking*, Taxmann Publications Pvt. Ltd., 2016 edition, 2016.
2. Jyotsna Sethi and Nishwan Bhatia, *Elements of Banking and Insurance*, PHI Learning Pvt. Ltd., 2nd edition, 2012.

III B.Tech. – I Semester

(20BT4HS03) COST ACCOUNTING AND FINANCIAL MANAGEMENT

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITE: --

COURSE DESCRIPTION: Cost accounting; cost sheet & preparation of cost sheet; standard costing & variance analysis; financial management & ratio analysis;introduction to investment**.**

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the concepts of Cost Accounting and Management Accounting and the elements of costing.
CO2. Determine the Cost of Production for pricing decisions..
CO3. Apply the Standard Costing and Variance techniques for the control of cost of production.
CO4. Analyze the Profitability and financial condition of an organization using Ratios.
CO5. Apply the Capital Budgeting techniques for making investment decisions in an Organization.

Mapping of COs with POs

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	1	-	-	-	-	-	-	1	-	-
CO3	-	3	2	-	-	-	-	-	-	2	-	-
CO4	1	3	2	-	-	-	-	-	-	2	-	-
CO5	-	3	2	-	-	-	-	-	-	2	-	-
Average	2	3	1.75	-	-	-	-	-	-	1.75	-	-
Course correlation levels	2	3	2	-	-	-	-	-	-	2	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: COST ACCOUNTING (9 Periods)

Meaning of Cost and Cost Accounting, Objectives, Scope, Advantages and disadvantages – Cost Accounting *Vs* Management Accounting – Elements of Costing – Installation of costing system – Material Control, Labor Control, Overhead Control.

UNIT-II:COST SHEET & PREPARATION OF COST SHEET (9 Periods)

Analysis of Cost – Preparation of cost sheet, estimate, tender and quotation (Simple problems) – Importance of Costing while pricing the products.

UNIT-III:STANDARD COSTING & VARIANCE ANALYSIS (9 Periods)

Introduction to Standard Costing & Variances – Variance Analysis: Material variances, Labor variances (Simple Problems).

UNIT-IV: FINANCIAL MANAGEMENT & RATIO ANALYSIS (9 Periods)

Meaning, Objectives - Nature and Scope, Importance of FM – **Ratio Analysis:** Types of Ratios: Solvency Ratios, Liquidity Ratios, Turnover Ratios and Profitability Ratios - Financial Statement Analysis through Ratios (Simple Problems).

UNIT-V: INTRODUCTION TO INVESTMENT (9 Periods)

Investment - Meaning and Definition- concept of risk and returns - Capital budgeting techniques – Security Analysis and Portfolio Management (Basic concepts).

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. S.P. Jain and K.L. Narang: *Cost Accounting*, Kalyani Publishers, Ludhiana, 10th edition, 2016.
2. I.M. Pandey, *Financial Management*, Vikas Publishing House Pvt. Ltd., 14th edition, 2016.

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, *Cost and Management Study Material*, New Delhi.
2. CA Saravana Prasath, *Cost Accounting and Financial management*, Wolters Kluwer India Pvt. Ltd., New Delhi,2018 edition,2018.

III B.Tech. – I Semester

(20BT4HS05) GENDER AND ENVIRONMENT

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Gender and the environment relationship, Gendered Roles in the family & community, Gender and sustainable development, Gender in environmental justice, Gender & environmental security.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the knowledge of gender & environmental connections by analyzing key issues and topics within global environmental politics in environmental decision-making.
CO2. Demonstrate the knowledge of the concepts of gender and sustainable development through debates and policy documents.
CO3. Analyze the concept of environmental security and justice by identifying the sources of insecurity.

Mapping of COs with POs

Course Outcome	Program Outcomes											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	1	-	-	-	3	3	-	-	-	-	-
CO2	3	-	-	-	-	2	3	1	-	2	-	-
CO3	3	1	-	-	-	3	3	-	-	-	-	2
Average	3	1	-	-	-	2.6	3	1	-	2	-	2
Course Correlation Level	3	1	-	-	-	3	3	1	-	2	-	2

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: GENDER AND ENVIRONMENT RELATIONSHIP (9 Periods)

Introduction – Gender and Environment – Development of gender roles – Society, gender & environment – Understanding environmental politics – Gender-environment connections–Eco-feminism – Cultural eco-feminism – Social eco-feminism – Feminist political ecology

UNIT-II: GENDERED ROLES IN THE FAMILY & COMMUNITY (9 Periods)

Organization of the household – Domestic division of labour – Food: growing, harvesting, shopping, preparing, and cooking

Gender & Power – Planning – Politics – NGO – Gendering of environmental protest – Environmental decision-making

UNIT-III: GENDER AND SUSTAINABLE DEVELOPMENT (9 Periods)

Concept of sustainability & its achievement – Concept of sustainable development – Ecological Modernization – Gender & sustainability debates – Gender & sustainable development debates - Gender in policy documents – Gender, poverty & equity in sustainable development

UNIT-IV: GENDER IN ENVIRONMENTAL JUSTICE (9 Periods)

Normative Concerns (Fairness, Inequality & Justice) –Making sense of Environmental justice – Ecological debt, Transnational harm, & human rights – Ecological justice – Gender &Environmental Justice – Gender, Vulnerability & risk – Women in environmental justice movements – Knowledge & participation – Gender, sustainability & justice as guiding concepts.

UNIT- V: GENDER AND ENVIRONMENTAL SECURITY (9 Periods)

Connections between security & the environment – **Gender, environment & security:** Sustainability as security – poverty & insecurity – Insecurity as injustice – Competing ways of thinking security – Reflecting on sources of insecurity – **Case Study** – Food Security -**Case Study** – The impacts of natural disasters

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. Nicole Detraz. *Gender and the Environment.* Polity Press, Cambridge, UK. 2017
2. Susan Buckingham- Hatfield. *Gender andEnvironment*. Routledge, London. 2000

REFERENCE BOOKS:

1. Promillakapur ed. *Empowering Indian Women*. Publication Division, Government of India, New Delhi. 2000.
2. Ronnie Vernooy, Ed. *Social and Gender Analysis Natural Resource Management: Learning Studies and Lessons from Asia.* Sage, New Delhi. 2006
3. Swarup Hemlata and Rajput, Pam. "Gender Dimensions of Environmental and Development Debate: The Indian Experience" In Sturat S. Nagel, (ed). *India's Development and Public Policy*. Ashgate, Burlington. 2000.

III B.Tech. – I Semester

(20BT4HS07) **INDIAN ECONOMY**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Introduction; Elementary Economic Analysis; Economic Planning; Time Value of Money; Value Analysis/Value Engineering.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Understand the basic concepts of economics, economic analysis, economic planning and strata.
CO2. Demonstrate knowledge in capital budgeting, evaluation of engineering projects, depreciation policy and familiarize with the concepts of value analysis vs value engineering.
CO3. Analyze and apply financial information for the evaluation of finance.

Mapping of COs with POs

Course Outcome	Program Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	2	-	-	-	-	-	-
CO2	3	-	-	-	-	2	-	-	-	-	-	2
CO3	3	-	-	-	-	2	-	-	-	-	-	2
Average	3	-	-	-	-	2	-	-	-	-	-	2
Level of correlation of the course	3	-	-	-	-	2	-	-	-	-	-	2

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION (9 Periods)

Economics-Flow in an Economy, Law of Supply and Demand; Micro and Macro Economics; Relationship between Science, Engineering, Technology and Economic Development; Concept of Engineering Economics-Types of Efficiency, Definition and Scope of Engineering Economics.

UNIT-II: ELEMENTARY ECONOMIC ANALYSIS (9 Periods)

Economic Analysis – Meaning, Significance, Simple Economic Analysis; Material Selection for a Product, Substitution of Raw Material; Design Selection for a Product;Material Selection-Process Planning, Process Modification.

UNIT-III: ECONOMIC PLANNING (9 Periods)

Introduction - Need For Planning in India, Five year plans(1951-2012), NITI Aayog (from 2014 onwards); Inclusive Growth-Meaning, Significance, Need for inclusive growth in India, Strategy for more inclusive growth, Challenges and Prospects; Employment and Inclusive Growth in India, Role of engineers in sustaining inclusive growth.

UNIT-IV: TIME VALUE OF MONEY (12 Periods)

Concepts and Application; Capital Budgeting-Traditional and Modern Methods; Simple and Compound Interest, Cash Flow Diagram, Principle of Economic Equivalence; Evaluation of Engineering Projects - Present Worth Method, Future Worth Method, Annual Worth Method, Internal Rate of Return Method, Cost-benefit Analysis in Public Projects; Depreciation Policy-Depreciation of Capital Assets, Causes of Depreciation, Straight Line Method and Declining Balance Method.

UNIT-V: VALUE ANALYSIS/VALUE ENGINEERING (6 Periods)

Introduction-Value Analysis, Value Engineering,Functions, Aims; Value Analysis vsValue Engineering; Value Engineering Procedure- Advantages, Application Areas.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. Panneerselvam. R., *Engineering Economics*, PHI Learning Private Limited, New Delhi,2nd edition, 2013.
2. Jain. T. R., V. K. Ohri, O. P. Khanna., *Economics for Engineers*. VK Publication,1st edition, 2015.

REFERENCE BOOKS:

1. DuttRudar&Sundhram K. P. M., *Indian Economy*, S. Chand, New Delhi, 62nd revised edition, 2010.
2. Misra, S. K. & V. K. Puri., *Indian Economy*: Its Development Experience, Himalaya Publishing House, Mumbai, 32nd edition, 2010.

III B.Tech. – I Semester

(20BT4HS09) **LIFE SKILLS**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:--

COURSE DESCRIPTION: Positive attitude; Self-discovery and Interpersonal relationships; Cross-cultural communication; Core thinking, Problem solving and Decision making; Business presentations and Public speaking.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of strategies involved in developing positive attitude, improvingself-discoveryby SWOT analysis techniques and managing effectiveinterpersonal relationships.

CO2. Apply appropriate speaking styles and techniques by analysing and demonstrating effective cross-cultural communication in different situations.

CO3. Analyse problem solving strategies in decision making by developing core thinking skills.

CO4. Analyse and demonstrate presentation and public speaking skills effectively inbusinessand professional arena.

Mapping of COs with POs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	3	-	-	-	-	2	3	-
CO2	1	2	-	-	3	-	-	-	-	3	-	-
CO3	1	3	-	-	2	-	-	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	-	3	-	-
Average	1.25	2	-	-	2.6	-	-	-	-	2.6	3	-
Course correlation Level	2	2	-	-	3	-	-	-	-	3	3	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: POSITIVE ATTITUDE (9 Periods)

Introduction–Features of attitudes–Formation of attitudes–Ways of changing attitude in a person– Attitude in a work place–Developing positive attitude–Obstacles in developing positive attitude–Measuring attitude.

UNIT-II: SELF DISCOVERY AND INTERPERSONAL RELATIONSHIPS (9 Periods)

Importance of knowing yourself–Process of knowing yourself–SWOT Analysis–Elements of attitude in interpersonal relationships–Methods to deal with different types of interpersonal relationship skills.

UNIT III: CROSS-CULTURAL COMMUNICATION (9 Periods)

Different communication styles – Cultural variables – Communication sensitivity and variables of national culture – Individual cultural variables – Cross-cultural communication Strategies – Potential hot spots in cross-cultural communication – Cross-cultural communication – Basic Tips.

UNIT IV: CORE THINKING, PROBLEM SOLVING AND DECISION MAKING (9 Periods)

Process of developing core thinking skills–Categories of thinking: Critical & Creative - understanding problem solving–Cause of problems–Stages of problem solving–Methods of problem solving–Types of decision making.

UNIT V: BUSINESS PRESENTATIONS AND PUBLIC SPEAKING (9 Periods)

Business presentations and speeches– Structuring the material–Types of delivery–Guidelines for delivery–Effective sales presentation–Controlling nervousness and stage fright.

Total Periods: 45

TOPICS FOR SELF STUDY:

- Knowing Successful Businessmen attitudes in distinguished situations. (PO12)
- Intra-Interpersonal skills (PO9)
- Knowing basic communication etiquettes (USA, Japan, Arab countries) (PO6)
- Case study (PO12)
- Sample Business presentation videos (PO10)

TEXTBOOKS:

1. Dr. K. Alex (2018) *Soft Skills*, S. Chand and Company Limited, New Delhi.
2. Manmohan Joshi (2017) *Soft Skills*, www.bookboon.com, Bangalore.

REFERENCE BOOKS:

1. Meenakshi Raman and Prakash Singh (2015) *Business Communication*, OxfordUniversity Press, New Delhi.
2. Jeff Butterfield (2011) *Soft Skills for Everyone*, Cengage Learning India Private Limited, Delhi.

III B.Tech. – I Semester

(20BT4HS11)INDIAN TRADITION AND CULTURE

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Basic traits of Indian Culture; Humanistic Reforms under Jainism and Buddhism; Culture in the medieval period; Socio Religious reforms in Indian Culture; Reform movements for harmonious relations.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in Vedic and Upanishadic culture and society to consider human aspirations, values and theories.
CO2. Understandthe contributions of Buddhism and Jainism to Indian culture.
CO3. Examine the cultural conditions and achievements of India under Mouryas and Guptas.
CO4. Analyze social religious reforms and reform movements.

Mapping of COs with POs

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	1	-	-	-	-	-	-
CO2	3	-	-	-	-	1	-	-	-	-	-	2
CO3	2	-	-	-	-	3	-	-	-	-	-	-
CO4	2	-	-	-	-	3	-	-	-	-	-	2
Average	2.5	-	-	-	-	2	-	-	-	-	-	2
Course correlation Level	3	-	-	-	-	2	-	-	-	-	-	2

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: BASIC TRAITS OF INDIAN CULTURE (9 Periods)

Meaning and definition and various interpretations of culture - Culture and its features - The Vedic and Upanishad culture and society - Human aspirations and values in these societies - Chaturvidha purushardhas, Chaturashrma and Chaturvarna theory.

UNIT-II: HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM (9 Periods)

Salient features of Jainism - contributions of Jainism to Indian culture - Contributions of Aachaarya and Mahaapragya - Buddhism as a humanistic culture - The four noble truths of Buddhism - Contributions of Buddhism to Indian culture.

UNIT-III: CULTURE IN THE MEDIEVAL PERIOD (9 Periods)

Unifications of India under Mouryas and Guptas and their cultural achievements - Cultural conditions under satavahanas - Contributions to pallavas and cholas to art and cultural achievements of vijayanagara rulers.

UNIT-IV: SOCIO RELIGIOUS REFORMS IN INDIAN CULTURE (9 Periods)

Western impact on India - Introduction of western education - social and cultural awakening and social reform movements of Rajaramohan Roy - Dayanandha Saraswathi - Anne Besant (theosophical society).

UNIT-V: REFORM MOVEMENTS FOR HARMONIOUS RELATIONS (9 Periods)

Vivekananda, Eswarchandravidyasagar and Veeresalingam - emancipation of women and struggle against caste - Rise of Indian nationalism - Mahatma Gandhi – Non-violence and satyagraha and eradication of untouchability.

Total Periods: 45

Topics for self study are included in lesson plan

TEXT BOOK:

1. Valluru Prabhakaraiah, *Indian Heritage and Culture*, Neelkamal Publications Pvt. Ltd. Delhi, 1/e , reprint 2015.

REFERENCE BOOKS:

1. L. P. Sharma, *History of Ancient India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
2. L. P. Sharma, *History of Medieval India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
3. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta

III B.Tech. – I Semester

(20BT4HS13)**CONSTITUTION OF INDIA**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Preamble and its Philosophy; Union Legislature; Federalism in India; Judiciary and Public Services; Nation Building

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge in the Parliamentary proceedings, Election Commission, Public Services and Foreign Policy of India.

CO2. Apply the reasoning informed by the various aspects of the Constitution and its provisions to assess societal issues and the consequent responsibilities relevant to the professional engineering practice.

Mapping of COs with POs

Course Outcome	**Program Outcomes**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	1	-	-	-	-	3	2	-	-	-	-	-
CO2	2	-	-	-	-	3	-	3	-	-	-	-
Average	3	-	-	-	-	3	-	3	-	-	-	-
Course Correlation Level	3	-	-	-	-	3	2	3	-	-	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: PREAMBLE AND ITS PHILOSOPHY (9 Periods)

Introduction to Indian Constitution; Evolution of Indian Constitution; preamble and its philosophy

UNIT-II: UNION LEGISLATURE (9 Periods)

The Parliament, Parliamentary Structure, Process of Legislation; President of India – Powers and Functions; Prime Minister and Council of Ministers; Constitution Amendment Procedure.

UNIT-III: FEDERALISM IN INDIA (9 Periods)

Centre-State Administrative Relationship;Governors - Powersand Functions; State Legislature - Composition and powers; Chief Ministers - Powers and Functions; The Election Commission – Powers and Functions.

UNIT-IV: JUDICIARY AND PUBLIC SERVICES (9 Periods)

The Union Judiciary - Supreme Court and High Court;Fundamental Rights and Duties All India Services - Central Civil Services -State Services - Local Services.

UNIT-V: INTERNATIONAL PARTICIPATION (9 Periods)

Foreign Policy of India; International Institutions Influence: UNO, WTO, WHO, SAARC, International Summits:BRICS, NSS, UNEP – India's Role in International Negotiations; Environmentalism in India.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOK:

1. Briji Kishore Sharma, *Introduction to the Constitution of India*, Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Mahendra Pal Singh,V. N. Shukla's, *Constitution of India*, Eastern Book Company, 2011.
2. Pandey J. N., *Constitutional Law of India* - Central Law Agency, 1998

III B.Tech. – I Semester

(20BT50106)**DISASTER MITIGATION AND MANAGEMENT**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the vulnerability of an area to natural and man-made disasters/hazards as per the guidelines to solve complex problems using appropriate techniques ensuring safety, environment and sustainability.

CO2. Propose appropriate mitigation strategies for earthquake and tsunami impacts as per code of practice using suitable techniques ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze the causes and impacts of floods, cyclones and droughts using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze the causes and impacts of landslides using appropriate tools and techniques and suggest mitigation measures ensuring safety, environment and sustainability.

CO5. Design disaster management strategies to solve pre, during and post disaster problems using appropriate tools and techniques following the relevant guidelines and latest developments ensuring safety, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2	2	2	2	2					3		
CO2	5	3	3	3	3	2	2	1	2		2			3		
CO3	4	3	3		2	2	2	2			2			3		
CO4	4	3	3		3	2	2	2						3		
CO5	6	3	2	3	2	2	2	1	2		1	3	2	3		
Average		3	2.8	3	2.4	2	2	1.6	2		1.67	3	2	3		
Course Correlation Levels		3	3	3	3	2	2	2	2		2	3	2	3		

Correlation Levels: 3 - High 2 - Medium 1 - Low

DETAILED SYLLABUS:

UNIT- I: DISASTERS (09 Periods)

Types of disasters - Natural disasters; Impact of disasters on environment, infrastructure and development; Concepts of hazards and vulnerability analysis, Hazard Assessment, Guidelines for hazard assessment and vulnerability analysis, Basic principles and elements of disaster mitigation.

UNIT- II: EARTHQUAKES (09 Periods)

Introduction to earthquake, Intensity scale (MSK–64), Seismic zones and activity in India, Action plan for earthquake disaster preparedness, Elements at risk, Recovery and rehabilitation after earthquake, Concepts of Earthquake resistant design and construction of buildings; Tsunami – Onset, Types and causes, Warning, Elements at risk, Typical effects, Specific preparedness and mitigation strategies, Case studies.

UNIT- III: FLOODS, CYCLONES AND DROUGHTS (11 Periods)

Floods and Cyclones:Onset, Types, Causes, Warnings, Elements at risk, Typical effects, Indian floods and cyclones, Hazard zones, Potential for reducing hazards, Mitigation strategies and community based mitigation, Case studies.

Droughts:Onset, Types and warning; Causes, Impact, Early warning and response mechanisms, Mitigation strategies, Droughts in India, Case studies.

UNIT- IV: LANDSLIDES (08 Periods)

Onset, Types and warning; Causes, Elements at risk, Indian landslides, Hazards zones, Typical effects, Mitigation strategies and community based mitigation, Case studies.

UNIT- V: DISASTER MANAGEMENT (08 Periods)

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases and Cost–benefit analysis, Disaster management programs implemented by NGOs and Government of India, Usage of GIS and Remote sensing techniques in disaster management, Leadership and Coordination in Disaster management, Emerging trends in disaster management.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Sharma, V. K.,*Disaster Management, Medtech Publishing, 2nd Edition, 2013*.
2. Anand S. Arya, Anup Karanth, and Ankush Agarwal, *Hazards, Disasters and Your Community: A Primer for Parliamentarians*, GOI–UNDP Disaster Risk Management Programme, Government of India, National Disaster Management Division, Ministry of Home Affairs, New Delhi, Version 1.0, 2005.

REFERENCE BOOKS:

1. Donald Hyndman and David Hyndman, *Natural Hazardsand Disasters*, Cengage Learning, 3rd Edition, 2011.
2. *Disaster Management in India,*A Status Report, Ministry of Home Affairs, Govt. of India, May 2011.
3. Rajendra Kumar Bhandari, *Disaster Education and Management: A Joyride for Students, Teachers, and Disaster Managers*, Springer India, 2014.
4. Singh, R. B.,*Natural Hazards and Disaster Management*, Rawat Publications, 2009.

ADDITIONAL LEARNING RESOURCES:

1. Tushar Bhattacharya, *Disaster Science and Management*, McGraw Hill, 2014.

III B.Tech. – I Semester

(20BT50107) **SUSTAINABLE ENGINEERING**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of sustainability; Sustainability metrics and assessment tools; Sustainable engineering practices; Sustainable engineering applications; Sustainable urbanization and industrialization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the principles of sustainability to solve complex environmental problems following relevant standards/protocols considering society, health, safety and environment.
CO2. Analyze sustainability metrics and assessment tools to solve complex environmental problems following relevant standards and emerging trends considering society, health, safety, environment and economics besides communicating effectively in graphical form.
CO3. Analyze sustainable engineering practices to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.
CO4. Design sustainable engineering applications to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.
CO5. Analyze sustainable urbanization and industrialization principles to solve complex environmental problems using appropriate tools and techniques following relevant standards considering society, health, safety, environment, economics and management besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		3		2	3	2							3
CO2	4	3	3		2	2	2	2	2		1	2	1			3
CO3	4	3	3		2	2	2	2	2		1	2				3
CO4	6	3	3	3	2	2	2	2	2		1	2				3
CO5	4	3	3		2	2	2	2	2		1	2				3
Average		3	3	3	2.2	2	2	2.2	2		1	2	1			3
Course Correlation Level		3	3	3	3	2	2	3	2		1	2	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT–I: PRINCIPLES OF SUSTAINABILITY (09 periods)

Emerging challenges, Sustainability and sustainable engineering; Environmental concerns; Social, economic and legal issues; Availability and depletion of natural resources, Disaster resiliency; Multilateral environmental agreements – Basel convention, Clean development mechanism (CDM), Montreal and Kyoto protocols.

UNIT–II: SUSTAINABILITY METRICS AND ASSESSMENT TOOLS (09 periods)

Sustainability indicators, metrics and assessment tools; Material flow analysis and material budget, Carbon footprint analysis, Life cycle assessment, Streamlined life-cycle assessment (SLCA), Economic input output-life cycle analysis, Environmental health risk assessment, Other emerging assessment tools.

UNIT–III: SUSTAINABLE ENGINEERING PRACTICES (09 periods)

Sustainable energy engineering, Sustainable waste management, Green and sustainable buildings and infrastructure, Sustainable civil infrastructure, Sustainable remediation of contaminated sites, Climate geoengineering.

UNIT–IV: SUSTAINABLE ENGINEERING APPLICATIONS (09 periods)

Environmental and chemical engineering projects, Materials engineering projects, Infrastructure engineering projects – Background, Methodology, Goal and Scope, Study area, Technical design, Environmental sustainability, Life cycle assessment, Economic sustainability, Social sustainability, Rating systems – ENVISION, LEED, GRIHA, IGBC; Conclusions.

UNIT–V: SUSTAINABLE URBANIZATION AND INDUSTRIALIZATION (09 Periods)

Sustainable urbanization and industrialization, United Nations sustainable development goals – Right to education, Poverty eradication, Social and technological changes; Industrial Processes - Material selection, Energy efficiency, Pollution prevention and control techniques, Industrial Ecology, Industrial symbiosis.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Reddy, K.R., Cameselle, C., and Adams, J.A., *Sustainable Engineering: Drivers, Metrics, Tools, and Applications*, John Wiley & Sons, Inc., Hoboken, New Jersey, 2019.
2. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Bradley. A.S; Adebayo, A. O., Maria, P., *Engineering Applications in Sustainable Design and Developmen*t, Cengage Learning, 1st Edition, 2016.
2. Purohit, S. S., *Green Technology: An Approach for Sustainable Environment*, Agrobios Publication, 1st Edition, 2016.
3. *Energy Conservation Building Code (ECBC) 2007*, Bureau of Energy Efficiency, Govt. of India, New Delhi.
4. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, Routledge, Taylor & Francis Group, 3rd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Daniel A. Vallero and Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, Wiley-Blackwell, 1st Edition, 2008.
2. Jorge A. Vanegas, *Sustainable Engineering Practice: An Introduction*, Committee on Sustainability, American Society of Civil Engineers, https://doi.org/10.1061/9780784407509, 2004.
3. Bell, S. and Morse, S, *Sustainability Indicators: Measuring the Immeasurable?*,Earthscan Publications, London, 2nd Edition, 2008.
4. Mackenthun, K.M., *Basic Concepts in Environmental Management*, CRC Press, Taylor & Francis Group, 1st Edition, 1999.
5. *Environment Impact Assessment Guidelines*, Notification of Government of India, 2006.

III B.Tech. – I Semester

(20BT50108)**CONTRACT LAWS AND REGULATIONS**
(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Construction contracts; Tenders; Arbitration; Legal requirements; Labour regulations.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:

CO1. Develop construction contracts to solve complex contract related problems by following laws and regulations considering project schedule, cost, quality and risk.

CO2. Prepare tenders as per the specifications by following latest developments, laws and regulations to solve complex tender problems considering project schedule, cost, quality and risk.

CO3. Analyze arbitration problems to address the contract disputes following the laws and regulations in the context of society.

CO4. Analyze legal issues pertaining to contracts and tenders considering society.

CO5. Analyze labour regulations to address labour safety issues.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	3	3	3	3	-	3	-	3	-	2	1	-	3	-	-
CO2	6	3	3	3	3	-	3	-	3	-	2	1	2	3	-	-
CO3	5	2	2	-	3	-	3	-	3	-	-	-	-	3	-	-
CO4	4	2	2	-	-	-	3	-	3	-	-	-	-	3	-	-
CO5	4	2	2	-	-	-	3	-	3	-	-	-	-	3	-	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: CONSTRUCTION CONTRACTS (09 Periods)

Indian contracts act, Elements of contracts, Types of contracts, Features, Suitability, Design of contract documents, International contract document and laws, Standard contract document, Law of torts.

UNIT – II: TENDERS (09 Periods)

Prequalification, Bidding, Accepting; Evaluation of tender from technical, contractual and financial points of view; Two cover system, Preparation of the documentation, Contract formation and interpretation, Potential contractual problems, Price variation clause, Comparison of actions and laws, Subject matter, Violations, Latest developments in tendering.

UNIT–III: ARBITRATION (09 Periods)

Arbitration, Comparison of actions and laws, Agreements, Appointment of arbitrators, Conditions of arbitration, Powers and duties of arbitrator, Rules of evidence, Enforcement of award, Arbitration disputes, Dispute review board.

UNIT – IV: LEGAL REQUIREMENTS (09 Periods)

Legal requirements for planning, Property law, Agency law, Tax laws – Income tax, Sales tax, Excise and custom duties, Local government approval, Statutory regulations, Insurance and bonding, Laws governing purchase and sale, Use of urban and rural land, Land revenue codes, EMD, Security deposits, Liquidated damages.

UNIT – V: LABOUR REGULATIONS (09 Periods)

Social security, Welfare legislation; Laws relating to wages, bonus and industrial disputes; Labour administration, Insurance and safety regulations, Workmen's compensation act, Maternity benefit act, Child labour act, Other labour laws.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Subba Rao, G.C.V., *Law of Contracts I & II*, S. Gogia& Co., 11th Edition, 2011.
2. Jimmie Hinze, *Construction Contracts,* McGraw Hill, 3nd Edition, 2011.

REFERENCE BOOKS:

1. Kishore Gajaria, *GT Gajaria's Law Relating to Building and Engineering Contracts in India*, Lexis NexisButterworths India, 4th Edition, 2000.
2. Patil, B. S., *Civil Engineering Contracts and Estimates*, University Press (India) Private Ltd., 4th Edition, 2015.
3. Joseph T. Bockrath, *Contracts and the Legal Environment for Engineers and Architects*, McGraw Hill Education, 7th Edition, 2010.
4. Akhileshwar Pathak, *Contract Law*, Oxford University Press, 2011.

ADDITIONAL LEARNING RESOURCES:

1. Markanda, P.C., Naresh Markanda, Rajesh Markanda, *Building and Engineering Contracts- Law and Practice*, Vol-I and II, LexisNexis Publication.5thEdition, 2017.

III B.Tech. – I Semester

(20BT50310) GLOBAL STRATEGY AND TECHNOLOGY

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: --

COURSE DESCRIPTION: Introduction to strategic management; Strategic management process; Principles of good strategy; Globalization strategies; Research and Development strategies; Technology Management and Transfer; Elements of Transfer Process; Corporate Governance in the Indian scenario.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the knowledge on strategic management, its approaches, and tools through ethical decision making.
CO2. Analyze the globalization challenges for scrupulous selection of globalization strategies.
CO3. Apply the R&D strategies and trends to enhance the technological breakthroughs for new products and applications.
CO4. Demonstrate the knowledge on technology management and transfer that strengthen the economy and accelerate the application of technology and resources.
CO5. Analyze the challenges of corporate governance in Indian scenario for the effective development of value oriented organizations.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1		1		2							
CO2	3	3	1	1		1		1							
CO3	3	2	2	1		1									
CO4	3	2	1	1		1									
CO5	3	3	1	1		1									
Average	3	2.2	1.2	1		1		1.5							
Correlation level	3	2	1	1		1		2							

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: STRATEGIC MANAGEMENT (9 periods)

Introduction, Classes of decisions, Levels of strategy, Core competence, Strategic intent and stretch, Approaches to strategy making, Roles of different strategists, Strategic management-Process, Benefits, Limitations; Ethics in strategic decision making, Principles of good strategy, Strategic Management in India; Common managerial strategy formulation tools.

UNIT-II: GLOBALIZATION (9 periods)

Definition, Stages, Essential conditions for globalization, Globalization strategies, Competitive advantage of Nations and regions, Factors affecting Globalization, Globalization of Indian business.

UNIT-III: RESEARCH & DEVELOPMENT STRATEGIES (9 periods)

Concept, Evolution of R and D Management, R and D as a business, R and D as competitive advantage, Elements of R and D strategies, Integration of R and D, Selection and implementation of R and D strategies, R and D trends and challenges.

UNIT-IV: TECHNOLOGY MANAGEMENT AND TRANSFER (9 periods)

Technology Management: Introduction, Technology-Definition, Components, Classification Features; Technology Management-Concept, Nature; Drivers of Management of Technology-Significance, Scope, Responding to technology challenges.

Technology Transfer: Introduction, Definition, Classification, Significance, Elements of process, Types of Technology Transfer, Package, Modes of Transfer, Routes, Channels and Effectiveness of Technology Transfer.

UNIT-V: CORPORATE GOVERNANCE: THE INDIAN SCENARIO (9 periods)

Emergence of corporate governance in India-Landmarks, Models, Codes and status in India, Role and Responsibilities of Regulators, The Board of Directors; Corporate Governance- Specific issues in India, Family owned Business, Corporate Governance and the Indian ethos.

Total periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. Francis Cherunilam, *Strategic Management*, Himalaya Publishing House, 3rdEdition, 2002.
2. C. S. G. Krishnamacharyulu and LalithaRamakrishnan, *Management of Technology*, Himalaya Publishing House, Second Edition, 2012.

REFERENCE BOOKS:

1. White and Bruton, *The Management of Technology and Innovation:A Strategic Approach*, Cengage Learning, 1stEdition, 2007.
2. S.K.Mandak, *Ethics in Business and Corporate Governance*, TMH, 2ndEdition, 2012.

III B.Tech. – I Semester

(20BT50311)**MANAGEMENT SCIENCE**
(Open Elective-2)
(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: --

COURSE DESCRIPTION: Concepts of Management; Concepts Related to ethics and social responsibility; Human Resource Management; Operations Management; Statistical Process Control; Inventory Management; Marketing; Project Management; Project Crashing.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the concepts of management, its functions and processes used in optimum resource utilization within the context of ethics and social responsibility.
CO2. Apply the concepts of HRM for selection and management of human resources.
CO3. Analyze different operations management problems using quality management tools to produce effective, efficient and adoptable products/services.
CO4. Identify different marketing strategies to maximize enterprise profitability and customer satisfaction within the realistic constraints.
CO5. Develop network models in time-cost tradeoff for effective project management.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1			1		2							
CO2	3	2	1			1		1							
CO3	3	3	2	1	1	1									
CO4	3	1	1			1									
CO5	3	3	3	1		1					3				
Average	3	2	1.6	1	1	1		1.5			3				
Correlation level	3	2	2	1	1	1		2			3				

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: MANAGERIAL FUNCTION AND PROCESS (10 periods)

Concept and foundations of management, Evolution of management thought; Managerial functions – Planning, Organizing, Directing and Controlling; Decision-making; Role of manager, managerial skills; Managing in a global environment, Flexible systems management; Social responsibility and managerial ethics; Process and customer orientation; Managerial processes on direct and indirect value chain.

UNIT-II: HUMAN RESOURCE MANAGEMENT (8 periods)

Human Resource challenges; Human Resource Management functions; Human Resource Planning; Job analysis; Job evaluation, Recruitment and selection; Training and Development; Promotion and transfer; Performance management; Compensation management and benefits; Employee morale and productivity; Human Resource Information System.

UNIT-III: OPERATIONS MANAGEMENT (10 periods)

Fundamentals of Operations Management, Services as a part of operations management; Facilities location and layout; Line balancing; Quality management – Statistical Process Control, Total Quality Management, Six sigma; Role and importance of materials management, Value analysis, Make or Buy decision, Inventory control, Materials Requirement Planning, Enterprise Resource Planning, Supply Chain Management.

UNIT-IV: MARKETING MANAGEMENT (8 periods)

Concept, evolution and scope; Marketing strategy formulation and components of marketing plan; Segmenting and targeting the market; Positioning and differentiating the market offering, Analyzing competition; Product strategy; Pricing strategies; Designing and managing marketing channels; Integrated marketing communications.

UNIT-V: PROJECT MANAGEMENT (9 periods)

Project management concepts; Project planning – Work Breakdown Structure, Gantt chart; Project scheduling – Critical Path Method, Program Evaluation and Review Technique, Crashing the project for time-cost trade off; Resource Levelling.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. MartandT.Telsang, *Industrial Engineering and Production Management*, S. Chand, 2nd Edition, 2006.
2. Koontz and Weihrich, *Essentials of Management*,TMH, 6th Edition, New Delhi, 2007.

REFERENCE BOOKS:

1. O.P. Khanna, *Industrial Engineering and Management*, DhanpatRai and Sons,2010.
2. N.D. Vohra, *Quantitative Techniques in Management*, TMH, 2nd Edition, New Delhi.
3. L.M. Prasad, *Principles and practice of Management*, S. Chand and Sons, 2006.

III B.Tech. – I Semester

(20BT40502) **CYBER LAWS AND SECURITY**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:

COURSE DESCRIPTION: Evolution of Cyberspace, Jurisdiction in the borderless Cyberspace, E-Contracting, Models of E-Commerce, Modes of Electronic signatures, E-Money, Intellectual Property Rights, Cybercrimes, Privacy and data security.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on jurisdiction in cyberspace and the impact of cybercrime to protect privacy on the Internet.
CO2. Analyze the Indian cyber laws on E-Contracting, E-Commerce, E-signatures and E-money to promote digital law enforcement.
CO3. Apply the knowledge of digital rights in Indian context to protect intellectual properties in electronic world.
CO4. Practice ethics and cyber law regulations for leading electronic transactions on the Internet.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	3	-	-	-	-	-	-			
CO2	3	2	-	-	-	3	-	-	-	-	-	-			
CO3	3	-	-	-	-	3	-	-	-	-	-	-			
CO4	-	-	-	-	-	-	-	3	-	-	-	-			
Average	3	2	-	-	-	3	-	3	-	-	-	-			
Correlation level	3	2	-	-	-	3	-	3	-	-	-	-			

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: EVOLUTION OF CYBERSPACE AND JURISDICTION IN BORDERLESS CYBERSPACE (9 Periods)

The Evolution of Cyberspace:Significance of information technology, Drawbacks in information technology, the digital divide, E-governance, Origin of cyberspace, Legal issues in cyberspace, regulating the Internet.

Jurisdiction in the Borderless Cyberspace:Meaning of jurisdiction, Three pre-requisites of jurisdiction, Jurisdictional theories in jurisdiction to prescribe, Tests to determine jurisdiction in Internet law cases, Indian laws to determine personal jurisdiction, Jurisdiction clauses in click wrap agreement.

UNIT-II: ELECTRONIC CONTRACTING AND ELECTRONIC COMMERCE (9 Periods)

Electronic Contracting: Formation of offline contracts under English common law, Fundamental requirements of an offline contract, Forming an E-contract through website, E-mail contracting, The Indian approach of E-contracts, Contract formation on the Internet and Information Technology Act 2000, B2C E-contracts.

Electronic Commerce:Models, Advantages, Restricted activities, Laws, India's information Technology Act2000, Online customer protection in India(B2B, B2C).

UNIT-III: ELECTRONIC SIGNATURES AND ELECTRONIC MONEY (9 Periods)

***Electronic Signatures*:** The role of signatures, Significance of electronic signatures, Modes of electronic signatures, UNCITRAL model law on electronic signatures 2001, Cryptography, Role of certifying authority in PKI, The Indian Information Technology Act and electronic signatures- Electronic signatures, Prescribed authentication mechanisms, Secure electronic record.

Electronic Money:E-Money, RBI's guidelines on mobile banking and payments, The current E-payment systems, Earlier E-payment systems, Credit cards, Use of SET in online payment system.

UNIT- IV: INTELLECTUAL PROPERTY RIGHTS AND THE INTERNET WORLD

(9 Periods)

Protecting copyright in the E-world, International organizations protecting Intellectual Property, Copyright issues on the Internet, Digital rights management, Patent protection and computer software, India and copyright protection for computer software, Business method patents- Position of Business methods patents in India, Trademark protection on the Internet, Cyber squatting, The Indian trademark law and legal remedies, Hyper linking and framing.

UNIT - V: CYBERCRIMES AND PROTECTING PRIVACY ON INTERNET (9 Periods)

Cybercrimes:What is cybercrime, Categories, Different kinds of cybercrime, Cybercrimes and Information Technology Act, 2000 - Territorial scope and applicability, India's national cyber security policy.

***Protecting Privacy on the Internet*:** Meaning of privacy, Threat to privacy on the Internet, Use of cookies and web bugs, Terms of use and privacy policy, Government right to interception, Employee privacy rights, Indian legal framework for data protection and privacy, Challenges to right of privacy in India.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOK(S):

1. Karnika Seth, *Computers Internet and New technology Laws*, LexisNexis, 2013.

REFERENCE BOOKS:

1. Sarika Gupta, Gaurav Gupta, *Information Security and Cyber Laws*, Khanna Publishing, 2019.

2. VivekSood, *Cyber Law Simplified*, McGraw Hill,2018.
3. PavanDuggal, *Textbook on Cyber Law*, Universal LexisNexis, 2019.

ADDITIONAL LEARNING RESOURCES:

- https://swayam.gov.in/nd2_cec20_cs09/preview
- https://swayam.gov.in/nd2_nou19_cs08/preview

III B.Tech. – I Semester

(20BT50206) **INTELLECTUAL PROPERTY RIGHTS**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION:

Introduction to Intellectual Property; Trade Marks; Law of Copy Rights; Law of Patents; Trade Secrets; Unfair Competition; New Development of Intellectual Property.

COURSE OUTCOMES: After successful completion of this course, student will be able to:

CO1. Understand the concepts of intellectual property right and new amendments enforced in filling intellectual property right.

CO2. Understand the processes and principles of trade mark registration and apply them for registering trade mark.

CO3. Understand the process and principles of copy rights registration and judicial consequences for violating laws of copyright/patents.

CO4. Understand the process and principles of trade secrets and judicial consequences for coping trade secrets.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	3	-	3	-	-	-	-			
CO2	2	-	-	-	-	2	-	2	-	-	-	-			
CO3	2	-	-	-	-	3	-	2	-	-	-	-			
CO4	2	-	-	-	-	3	-	2	-	-	-	-			
Average	2.25	-	-	-	-	2.75	-	2.25	-	-	-	-			
Correlation level	2	-	-	-	-	3	-	2	-	-	-	-			

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: INTRODUCTION TO INTELLECTUAL PROPERTY (10 periods)

Introduction and the need for intellectual property rights (IPR); types of intellectual property- Design, Geographical Indication; International organizations, agencies and treaties.

UNIT-II: TRADEMARKS (08 Periods)

Introduction to trademark, Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT-III: LAW OF COPYRIGHTS (09 Periods)

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-IV: TRADESECRETS (09 periods)

Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

UNIT-V: NEW DEVELOPMENT OF INTELLECTUAL PROPERTY (09 periods)

New developments in: trade mark law, copy right law, patent law, intellectual property audits. International overview on intellectual property; international - trade mark law, copy right law, international patent law, international development in trade secrets law.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

TEXT BOOKS:

1. Deborah, E. Bouchoux, *Intellectual property: The law of Trademarks, Copyright, Patents, and Trade Secrets,* cengage learning, 4th edition, 2013.
2. PrabuddhaGanguli, *Intellectual property right - Unleashing the knowledge economy*, Tata McGraw Hill Publishing Company Ltd.

REFERENCE BOOKS:

1. Neeraj P., &Khusdeep D. Intellectual Property Rights. India, IN: PHI learning Private Limited. 1st edition 2019.

ADDITIONAL LEARNING RESOURCES:

1. Subramanian, N., &Sundararaman, M. (2018). *Intellectual Property Rights – An Overview*. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf
2. World Intellectual Property Organisation. (2004). *WIPO Intellectual property Handbook*.
   Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf

USEFUL WEBSITES:

1. Cell for IPR Promotion and Management(http://cipam.gov.in/)
2. World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)
3. Office of the Controller General of Patents, Designs & Trademarks (http://www.ipindia.nic.in/)

III B.Tech. – I Semester

(20BT50406) **GREEN TECHNOLOGIES**

(Open Elective-2)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze energy efficient communication systems such as Telecommunication systems, ICT, Wireless networks and cellular networks by understanding the principles of green communications.
CO2. Understand the impact of conventional energy sources on environment and realize the significance and principles of green energy sources for sustainability.
CO3. Understand the environmental impacts of IT and approaches for Green IT.
CO4. Analyze concepts of sustainable green construction using appropriate tools and techniques following latest developments and considering safety and environment besides communicating effectively in graphical form.
CO5. Demonstrate the environmental impact of traditional manufacturing and explore the need for green manufacturing process promoting sustainability.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	-	-	2	-	-	-	-	-	-			
CO2	3	1	-	-	-	2	3	-	-	-	-	-			
CO3	3	-	-	-	-	2	3	-	-	-	-	-			
CO4	3	3	-	2	2	-	-	-	-	-	-	-			
CO5	3	2	-	-	-	-	3	-	-	-	-	-			
Average	2.8	2.25	-	2	2	2	3	-	-	-	-	-			
Correlation level	3	3	-	2	2	2	3	-	-	-	-	-			

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT –I: PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS (9 Periods)

Principles of Green Engineering:Introduction, Definition of green engineering, Principles of green engineering

Green Communications:Introduction, Origin of Green Communications, Energy Efficiency in Telecommunication systems, Telecommunication system model and energy Efficiency, Energy saving concepts, Quantifying energy efficiency in ICT, Energy efficiency metrics of green wireless networks, Embodied energy of communication devices- Introduction, The extended energy model, Embodied/Operating Energy of a BS in Cellular network- A Case study; Energy efficient standards for wireline communications.

UNIT- II: GREEN ENERGY (9 Periods)

Introduction, green energy systems - composition, adverse impacts, Green energy and sustainability, the target and solution. Diversification and localization of energy systems, green energy and sustainable development. Energy sources and their availability. Green energy sources - solar energy, wind energy, geothermal energy, ocean energy, biomass and biogas.

UNIT- III: GREEN IT (9 Periods)

Introduction, Awareness to Implementation: Green IT Trends, Green Engineering, Greening by IT: Using RFID for Environmental Sustainability, Smart Grids, Smart Buildings and Homes, Green Supply Chain and Logistics, Enterprise-Wide Environmental Sustainability, A Seven-Step Approach to Creating Green IT Strategy: Balancing the Costs and Benefits of Going Green, Research and Development Directions.

UNIT- IV: GREEN CONSTRUCTION (9 Periods)

***Green Building*:** Concept, Necessity, Characteristics, Benefits, Requisites for green building construction, Sustainability, Concept of REDUCE, REUSE, RECYCLE, RETHINK, REPLENISH AND REFUSE (6 R's), Sustainable construction focus point – Site selection, Planning, Water, Energy, Material, Indoor air quality, Construction procedures, case studies of residential and commercial green buildings.

***Vastu*:** Concept, History, scientific approach, elements of vastu for selecting a plot.

***Indian Green Building Council*:** Introduction to IGBC green homes, Benefits of IGBC, IGBC green home rating system, Introduction to USGBC, LEED rating system, Procedure to get IGBC certification, GRIHA Rating.

UNIT- V: GREEN MANUFACTURING (9 Periods)

Green Manufacturing - Introduction, Background and Definition; Impact of traditional manufacturing in environmental ecology, Need for green manufacturing, Motivation and barriers to green manufacturing, Advantages and Limitations of green manufacturing, Green manufacturing strategies, Green manufacturing and sustainability, Green manufacturing through clean energy supply, Green packaging and Supply chain.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. KonstantinosSamdanis, Peter Rost, Andreas Maeder, MichelaMeo, Christos Verikoukis, *Green Communications: Principles, Concepts and Practice*, John Wiley & Sons, 2015.
2. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, Delhi, 5th Edition,2011.
3. San Murugesan, G.R. Gangadharan, *Harnessing Green IT – Principles and Practices*, John Wiley & Sons Ltd., 2008.
4. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison, *Green Building Handbook*, Volume 1, E & FN Spon, an imprint of Thomson Science & Professional.
5. J Paulo Davim, *Green Manufacturing: Processes and Systems*, Springer, 2012.
6. David A Dornfeld, *Green Manufacturing: Fundamentals and Applications*, Springer, 2013.

REFERENCE BOOKS:

1. Soli J. Arceivala, *Green Technologies for a better future,* McGraw Hill Education (India) Pvt. Ltd, 2014.
2. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
3. Athanasios V Alavanidis, ThomaisVlachogianni, *Green Chemistry and Green Engineering*, SynchronaThemata, 2012.

III B. Tech. – I Semester

(20BT50442)**PRINCIPLES OF IMAGE PROCESSING**

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: --

COURSE DESCRIPTION: Fundamentals of digital image processing; Image transforms; Image enhancement techniques in spatial and frequency domains; Restoration techniques & image segmentation techniques; Morphological operations; Representation and description; Pattern recognition.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply transformations on images by analyzing basic operations on images.
CO2. Apply various image enhancement techniques in spatial and frequency domains to improve the quality of image.
CO3. Apply restoration techniques based on noise models and degradation function to restore the images, pertaining to health and societal applications.
CO4. Analyze various segmentation techniques on images for societal applications.
CO5. Analyze appropriate techniques for morphological operations and reconstruction of images.
CO6. Analyze various techniques to understand image features.

Mapping of COs with POs and PSOs

Course outcome	Program Outcomes												Program specific outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	3	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	2	2	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	2	2	-	-	-	-	-	-	-	-	-
CO6	3	3	-	-	-	2	-	-	-	-	-	-	-	-	-
Average	3	2.5	1	-	2.6	1.8	-	-	-	-	-	-	-	-	-
Course Correlation Level	**3**	**3**	**1**	**-**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: DIGITAL IMAGE FUNDAMENTALS (09 periods)

Fundamental steps in digital Image Processing, Image sampling & quantization, some basic relationships between pixels, arithmetic operations, Logical operations, Spatial operations.

Image Transforms:2D-DFT and properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform.

UNIT-II: IMAGE ENHANCEMENT (09 periods)

Basic Intensity transformation functions, Histogram processing, Fundamentals of Spatial Filtering, Smoothing spatial filters, Sharpening spatial filters, Basics of filtering in

frequency domain, Image smoothing using frequency domain filters, Image sharpening using frequency domain filters, Homomorphic filtering.

UNIT-III: IMAGE RESTORATION AND SEGMENTATION (09 periods)

Image degradation/Restoration model, Estimating the degradation function, Inverse filtering, Weiner filtering, Constrained least squares filtering. Detection of discontinuities-Point, line and edge Detection. Thresholding-global thresholding, adaptive thresholding. Region based Segmentation.

UNIT-IV: MORPHOLOGICAL PROCESSING (09 periods)

Preliminaries, Erosion and Dilation, opening and closing, Some basic morphological algorithms- boundary extraction, extraction of connected components, thining, thickening, skeletons, pruning, morphological reconstruction; gray scale morphology-Erosion and Dilation, opening and closing, gray scale morphology algorithms.

UNIT-V: REPRESENTATION, DESCRIPTION AND RECOGNITION (09 periods)

Chain codes, polygonal approximation, signatures, boundary segments, skeletons, boundary descriptors, regional descriptors, Pattern and pattern classes, recognition based on decision Theoretic methods- matching, optimum statistical classifiers.

Total Periods: 45

Topics for Self Study are provided in the Lesson Plan

TEXT BOOKS:

1. Rafael C.Gonzalez & Richard E. Woods,*Digital Image Processing*, Pearson Education,3rdEdition, 2008.
2. AnilK. Jain, *Fundamentals of Digital Image processing*, Prentice Hall, 4th Edition, 2007.

REFERENCE BOOKS:

1. William K. Pratt, *Digital Image processing*,John Wiley & Sons Inc. 3rdEdition, 2001.
2. Earl Gose, Richard Johnsonbaugh, and Steve Jost, *Pattern Recognition and Image Analysis*, Pearson Education Services Pvt. Ltd, 1st Edition, 2015.

III B. Tech. – I Semester

(20BT50202) ENERGY AUDIT, CONSERVATION AND MANAGEMENT

(Interdisciplinary Elective-1)

(Common to CE and EEE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: A course on Basic Electrical and Electronic Engineering.

COURSE DESCRIPTION: Principles of energy audit, management and conservation; Energy efficient motors, lighting schemes; Energy measuring instruments and significance of energy economics.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the relevant rules, regulations and procedures of energy audit in industries and realize the energy management principles and protocols for effective conservation of energy.
CO2. Analyze performance of energy efficient motors and propose appropriate illumination system by applying the protocols of energy auditing.
CO3. Apply appropriate energy auditing instruments for energy auditing in industries and assess the economic benefits of auditing.
CO4. Apply the demand side management techniques and relevant standards for organization of energy conservation awareness programs.

Mapping of COs with POs and PSOs:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	--	--	2	2	1	1	--	--	--	1	--	1	2
CO2	3	3	2	--	1	2	1	1	--	--	--	--	2	3	1
CO3	3	2	2	--	2	2	2	1	--	--	2	--	2	1	3
CO4	3	3	--	--	2	1	3	1	--	--	--	--	2	1	2
Average	3	2.25	2	--	1.75	1.75	1.75	1	--	--	2	1	2	1.5	2
Course Correlation Level	3	2	2	--	2	2	2	1	--	--	2	1	2	2	2

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT-I: ENERGY AUDIT AND MANAGEMENT PRINCIPLES (10 Periods)

Energy audit — definitions, concept, types of audit, energy index-cost index, pie charts, Sankey diagrams, load profiles, energy audit in industries, energy saving potential, energy audit of process industry, thermal power station, building energy audit, case study. IE rules and regulations for energy audit.

Energy management — Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

UNIT-II: ENERGY CONSERVATION PRINCIPLES (08 Periods)

Energy scenario in India and world. Rules for efficient energy conservation; technologies for energy conservation. Principles of energy conservation, current energy consumption in India, roles and responsibilities of energy managersin industries.

UNIT-III: ENERGY EFFICIENT MOTORS AND LIGHTING (09 Periods)

Energy efficient motors - factors affecting efficiency, loss distribution, constructional details, characteristics, variable speed, variable duty cycle systems, motor energy audit.

Lighting **-**Good lighting system design and practice, lighting control, lighting energy audit.

UNIT-IV: ENERGY INSTRUMENTS AND ECONOMIC ANALYSIS (09 Periods)

Energy Instruments— Infrared thermometer, data loggers, thermo-couples, pyrometers, Lux meters, tongue testers, power quality analyzer, and PLC and pic applications.

Energy Economic Analysis— The time value of money concept. Cash flow models, payback analysis, depreciation, taxes and tax credit - numerical problems.

UNIT-V: DEMAND SIDE MANAGEMENT (09 Periods)

Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, and time of day models for planning, load management, load priority technique; Management and organization of energy conservation awareness programs.

Total Periods: 45

Topics for Self-study are provided in the Lesson Plan

REFERENCE BOOKS:

1. W.R. Murphy & G. Mckay Butter Worth, *Energy management*, Butter worth-Heinemann publications, 2nd Edition, 2016.
2. Albert Thumann, William J. Younger, *Handbook of Energy Audits*, Taylor & Francis Ltd,7th edition, 2008.
3. UmeshRathore, *Energy Management*, S.K. Kataria& Sons, 2nd Edition, 2014.
4. W.C.Turner,Stevedoty, *Energy Management Hand Book*, CRC press, 6th Edition, 2006.
5. D.P. Sen, K.R. Padiyar, IndraneSen, M.A. Pai, *Recent Advances in Control and Management of Energy Systems*, Interline Publisher, Bangalore, 1993.
6. Ashok V. Desai, Wiley Eastern, *Energy Demand - Analysis, Management and Conservation Hand Book on Energy Auditing - TERI (Tata Energy Research Institute)*, 2005.
7. Craig B. Smith, Kelly E. Parmenter, *Energy Management Principles Applications*, benefits, Savings, Elsevier Inc(Pergamon Press), 1st Edition, 2016.

ADDITIONAL LEARNING RESOURCES:

1. https://beeindia.gov.in/sites/default/files/1Ch3.pdf
2. https://www.youtube.com/watch?v=M1zijCmeXJg
3. https://www.youtube.com/watch?v=FTpMWXMBSyM
4. https://www.youtube.com/watch?v= T1Au P5bnQ
5. https://www.youtube.com/watch?v=ENLzwTVjxms
6. https://www.youtube.com/watch?v=7hDyLuFJ0c8
7. https://www.youtube.com/watch?v=lkNIuFkzxBk

USEFUL WEBSITES:

1. https://beeindia.gov.in/news-events/energy-conservation-building-code-rules-2018
2. https://beeindia.gov.in/content/energy-auditors
3. https://nayaenergy.com/difference-between-energy-audit-and-energy-management/
4. https://www.sgsgroup.in/en-gb/sustainability/environment/energy- services/energy-audits-and-management/energy-audit
5. https://www.consultivo.in/environment-energy/energy-audit-and-management/
6. https://www.teriin.org/energy
7. http://jnujprdistance.com/assets/lms/LMS%20JNU/Dual%20Degree%20Courses/PGD+MBA%20-%20Energy%20Management/Sem%20III/General%20Aspects%20of%20Energy%20Management%20and%20Energy%20Audit.pdf

III B. Tech. I-Semester

(20BT70302) COMPUTATIONAL FLUID DYNAMICS

(Interdisciplinary Elective – 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Multi-Variable Calculus and Differential Equations and Fluid Mechanics.

COURSE DESCRIPTION: Introduction to Computational Fluid Dynamics(CFD); Various Numerical methods; Solution methods for governing equations; Finite difference method and its application to heat transfer problems; Errors and stability analysis; Finite Volume method; Study flow analysis; Simple CFD techniques.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply governing equations of fluid dynamics for solving fluid mechanics and heat transfer problems.

CO2. Apply Discretization Techniques to solve algebraic equation ofGrids with Appropriate Transformation.

CO3. Analyze numerical models of the Fluid flow and Heat transfer phenomenon usingfinite difference method as discretization and grid generation techniques for ParabolicPartial Differential Equations.

CO4. Analyze numerical models of the Fluid flow and Heat transfer phenomenon using finite difference method as discretization and grid generation techniques for elliptic and hyperbolic equations.

CO5. Analyze mathematical models of fluid dynamics using Finite volume approach.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1											
CO2	3	3	2	1	1										
CO3	3	3	2	1	1										
CO4	3	3	2	1	1										
CO5	3	3	2	1	1										
Average	3	3	2	1	1										
Correlation level	3	3	2	1	1										

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: GOVERNING EQUATIONS (9 periods)

Introduction, applications of CFD in diverse fields, Governing equations of fluid dynamics – Continuity, Momentum and energy equations; Generic differential and integral form for governing equations, Initial and Boundary conditions, Differences between Finite element method, Finite difference method and Finite volume method, Classification of partial differential equations – Hyperbolic, Parabolic, Elliptic and Mixed types; Applications and relevance.

UNIT – II: DISCRETIZATION TECHNIQUES (9 periods)

Basic Aspects of Discretization: Introduction to finite differences, Finite difference equations using Taylor series expansion and polynomials, Explicit and implicit approaches, Uniform and unequally spaced grid points.

Grids With Appropriate Transformation: General transformation of the equations, Metrics and Jacobians, The transformed governing equations of the CFD, Boundary fitted coordinate systems, Algebraic and elliptic grid generation techniques, Adaptive grids.

UNIT – III: FINITE DIFFERENCE FORMULATIONS (9 periods)

Parabolic Partial Differential Equations: Finite difference formulations, Explicit methods – FTCS, Richardson and DuFort-Frankel methods, Implicit methods – Laasonen, Crank-Nicolson and Beta formulation methods, Approximate factorization, Fractional step methods, Consistency analysis, Linearization.

Stability Analysis: Discrete Perturbation Stability analysis, von Neumann Stability analysis, Error analysis, Modified equations, Artificial dissipation and dispersion.

UNIT – IV: ELLIPTIC AND HYPERBOLIC EQUATIONS (9 periods)

Elliptic Equations: Finite difference formulation, solution algorithms: Jacobi-iteration method, Gauss-Siedel iteration method, point- and line-successive over-relaxation methods, alternative direction implicit methods.

Hyperbolic Equations: Explicit and implicit finite difference formulations, splitting methods, multi-step methods, applications to linear and nonlinear problems, linear damping, flux corrected transport, monotone and total variation diminishing schemes, tvd formulations, entropy condition, first-order and second-order TVD schemes, introduction to modern tools.

UNIT – V: FINITE VOLUME METHOD (9 periods)

Introduction, Finding the flux at interface, Central schemes - Lax-Friedrichs Method, Lax-Wendroff Method, Two-Step Lax-Wendroff Method and MacCormack Method; Upwind Method in Finite Volume methods - Flux Splitting Method Steger and Warming, vanLeer, Roe's Method and finding Roe's Averages; Numerical procedure for SIMPLE algorithm, Boundary conditions for the pressure correction method; Stream function, Vorticity method, introduction to modern tools.

Total periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. John. D. Anderson, *Computational Fluid Dynamics, The Basics with Applications*, McGraw Hill. Indian Edition, 2017.
2. Hoffman, K.A., and Chiang, S.T., *Computational Fluid Dynamics, Vol. I, II and III*, Engineering Education System, Kansas, USA, 2000.

REFERENCE BOOKS:

1. Tapan K. Sengupta, *Fundamentals of Computational Fluid Dynamics*, 1st Edition, Universities Press, 2004.
2. Suhas V. Patankar, *Numerical Heat Transfer and Fluid Flow*, 1st Edition, CRC, 1980.

III B. Tech. – I Semester

(20BT50104) CONSTRUCTION EQUIPMENT AND AUTOMATION

(Interdisciplinary Elective 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE - REQUISITES: Course onConstruction, Planning and Project Management

COURSE DESCRIPTION: Construction equipment and management; Earthwork equipment and material handling equipment; Asphalt and concrete plants and other construction equipment; Building automation system; Automation and robotics in construction.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Categorize construction equipment to solve complex construction problems considering safety, project management and finance besides communicating effectively in graphical form.

CO2. Analyze earthwork and material handling equipmentto solve complex construction problems ensuring safety and environment besides communicating effectively in graphical form.

CO3. Analyze asphalt and concrete plants and other construction equipmentto solve construction problems following latest developments ensuring safety and environment besides communicating effectively in graphical form.

CO4. Analyze building automation system to solve construction problems using appropriate tools and techniques following relevant standards and latest developments considering society, project management and finance besides communicating effectively in graphical form.

CO5. Analyze automation and robotics in constructionto solve construction problems using appropriate techniques following latest developments considering society, project management and finance besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		1	3	1	1			2	2	1	3		
CO2	4	2	3		1	3	1	1			2			3		
CO3	4	2	3		1	3	1	1			2		1	3		
CO4	4	2	3			3	1		1		2	2	1	3		
CO5	4	2	3			3	1				2	2	1	3		
Average		2	3		1	3	1	1	1		2	2	1	3		
Course Correlation Level		2	3		1	3	1	1	1		2	2	1	3		

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT I CONSTRUCTION EQUIPMENT AND MANAGEMENT (8 periods)

Identification, Planning of equipment, Selection of Equipment, Equipment Productivity, Equipment Management in Projects, Maintenance Management, Equipment cost, Operating cost, Cost Control of Equipment, Depreciation Analysis, Replacement of Equipment, Replacement Analysis, Safety Management

UNIT II EARTHWORK EQUIPMENT AND MATERIAL HANDLING EQUIPMENT (10 Periods)

Earthwork Equipment:Fundamentals of Earth Work Operations, Earth Moving Operations, Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers; Front end Waders – Dozer, Excavators, Rippers, Loaders, Compacting Equipment, Finishing equipment.

Material Handling Equipment:Forklifts and related equipment, Portable Material Bins, Conveyors, Trucks and Hauling equipment.

UNIT III ASPHALT AND CONCRETE PLANTS AND OTHER CONSTRUCTION EQUIPMENT (10 Periods)

Asphalt and Concrete plants:Aggregate production, Different Crushers, Feeders, Screening Equipment, Handling Equipment, Batching and Mixing Equipment, Pumping Equipment, Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment

Other Construction Equipment:Equipment for Dredging, Trenching, Drag line and clamshells, Tunnelling, Equipment for Drilling and Blasting, Pile driving Equipment, Erection Equipment, Crane, Mobile crane, Types of pumps used in Construction, Equipment for Dewatering and Grouting, Equipment for Demolition

UNIT - IVBUILDING AUTOMATION SYSTEM (8 Periods)

Building Automation System (BAS)**-** Concept, Applications, Requirements, Design considerations, Effect on functional efficiency, Architecture and Components of BAS; Building Information Modelling (BIM) – Construction life cycle using BIM, Applications; Sensors to collect and process data, Virtual reality during project planning, training and management.

UNIT - V AUTOMATION AND ROBOTICS IN CONSTRUCTION (9 Periods)

Automation: Advantages and disadvantages,Need,Applications - Automation in precast construction industry, high rise buildingconstruction, prefabrication of masonry, onsite masonry construction, manufacture of brick wall masonry blocks, timber construction, production of steel components; Autonomous machines on the construction site, Drones to surveyworking areas, Automatic concrete screeding machine.

Robotics in Construction: Tele-operated robots, Programmed Robots and Cognitive Robots - Use of robots for repetitive activities; Challenges in construction robotics, Robotics in concrete works,Concrete surface finishing robot,Transformable welding robot.

Total periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Sharma, S.C. *Construction Equipment and Management*, Khanna Publishers, New Delhi, 6th Edition, 2015.
2. Mahesh Varma, *Construction Equipment and its Planning and Application*, Metropolitan Book Company, New Delhi. 1983.

REFERENCE BOOKS:

1. Deodhar, S.V., *Construction Equipment and Job Planning*, Khanna Publishers, New Delhi, 1988.
2. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., *Construction Planning, Equipment and Methods*, McGraw Hill, Singapore, 2006.
3. Thomas Boak and Thomas Linner, *Construction Robots - Elementary Technologies and Single-Task Construction Robot*, Cambridge University Press, 2017.
4. Bimal Kumar, *A Practical Guide to Adopting BIM in Construction Projects*, Whittles Publishing Pvt. Ltd., Dunbeath, Scotland, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Carpehart, B. L. and Lynne C. Capehart, *Web Based Enterprize Energy and Building Automation Systems*, Fairmont Press, 2007.
2. Mikell P. Groover,*AutomationProduction System and Computer – Integrated Manufacturing*, Pearson Higher Education, Inc., 4th Edition, 2015.

III B. Tech. I Semester

(20BT50105) **PIPELINE ENGINEERING**

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Fluid Mechanics, Hydraulic Engineering.

COURSE DESCRIPTION: Elements of pipeline designand route selection; Pressure drop calculations; Gas compression and coolers; Pumps and transient flow in liquid; Pipeline design.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze elements of pipeline design and route selection to solve pipeline engineering problems using appropriate techniques by following relevant codes and standards consideringsociety, environment and economics besides communicating effectively in graphical form.

CO2. Analyze pressure drop calculations to solve complex pipeline engineering problems using appropriate techniques by following relevant codes for the benefit of the society considering environment besides communicating effectively in graphical form.

CO3. Analyze gas compressors and coolers to solve complex pipeline engineering problems using appropriate techniques by following relevant codes considering safety and environment besides communicating effectively in graphical form.

CO4. Design pump station piping for the fluid flow to solve complex pipeline engineering problems using appropriate techniques by following relevant codes considering safety and environment besides communicating effectively in graphical form.

CO5. Analyzetransient flow in liquid to solve complex pipeline engineering problems using appropriate techniques considering safety and environment besides communicating effectively in graphical form.

CO6. Design a pipelineto solve complex pipeline engineering problems using appropriate techniques by following relevant codes considering safety and environment besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		2	1	1	1	1		1					3
CO2	4	2	3		2	1	1	1	1		1					3
CO3	4	2	3		2	1	1	1	1		1					3
CO4	6	1	2	3	2	1	1	1	1		1					3
CO5	4	2	3		2	1	1	1	1		1					3
CO6	6	1	2	3	2	1	1	1	1		1					3
Average		1.67	2.67	3	2	1	1	1	1		1					3
Course Correlation Level		2	3	3	2	1	1	1	1		1					3

Correlation Levels: 3: H – High 2: M – Medium 1: L – Low

DETAILED SYLLABUS:

UNIT I– ELEMENTS OF PIPELINE DESIGN AND ROUTE SELECTION (09 periods)

Elements of Pipeline Design:Scope of Pipeline Engineering; History of Pipelines in India, Fluid properties; Environment - Effects of pressure andtemperature; Supply/Demand scenario; Codes and standards – Environmentaland hydrological considerations; Economics - Materials/Construction – Operation; Pipelineprotection - Pipeline integrity monitoring.

Pipeline Route Selection: Introduction - Preliminary routeselection - Key factors for route selection; Engineering survey - Legal survey - Construction /As-built survey - Geotechnical design.

UNIT II – PRESSURE DROP CALCULATIONS (09 periods)

General flow equation – Weymouth Equation, Panhandle A equation, Panhandle BEquation, Steady state; Transmission Factor, Effect of Pipeline Elevation (Single Slope, Multiple Slope), Pressure drop calculation for pipeline in series and parallel; Pipeline gas velocity –Erosional velocity, FrictionFactor Calculations.; Optimum pressure drop for design purposes; Pipeline packing –Determining gas leakage using pressure drop method; Wall thickness/pipe grade; Temperatureprofile – Optimization process – Gas transmission solved problems.

UNIT III – GAS COMPRESSION AND COOLERS (09 periods)

Gas Compression:Types of compressors; Compressor drivers; Compressor stationconfiguration; Thermodynamics of isothermal and adiabatic gas compression; Temperaturechange in adiabatic gas compression; Thermodynamics of polytropic gas compression; Gascompressors in series; Centrifugal compressor horsepower; Enthalpy / Entropy charts (Mollierdiagram); Centrifugal compressor performance curve; Reciprocation compressors.

Coolers: Gas coolers – Aircooled heat exchangers; Heat transfer equations for coolers; Fanair mass flow rate; Required fan power; Gas pressure drop in coolers; Iterative procedure forcalculations based on unknown T_2.

UNIT IV –PUMPS *AND TRANSIENT FLOW IN LIQUID* (08 periods)

Pumps:Fully developed laminar flow in a pipe; Turbulent flow; Centrifugalpumps – Retrofitting for centrifugal pumps (Radial-flow); Pump station control – Pump stationpiping design.

Transient Flow in Liquid: Purpose of transient analysis; Theoreticalfundamentals and transient solution technique; Applications – Computer applications.

UNIT V – PIPELINE DESIGN (10 periods)

Pipeline Mechanical Design:Codes and standards, Location classification; Pipeline designformula, Expansion and flexibility, Joint design for pipes of unequal wall thickness; Valueassemblies, Scraper traps, Buoyancy control; Crossings – Depth of cover – Aerial markings –Warning signs; Pipeline Construction and Commissioning.

Materials Selection:Elements of design – Materials designation standards.

Pipeline Protection*:* Pipeline coating; Cathodic protection –Cathodic protection calculations for land pipelines; Internal corrosion; Flow meters and theircalibration – Sensors – Pigs.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Mahitpour, M., Golshan, H. and Murray,M.A.,*Pipeline Design and Construction: A Practical Approach*, ASME Press, 3rd Edition, 2010.
2. Henry Liu, *Pipeline Engineering*, Lewis Publishers (CRC Press), 2003.

REFERENCE BOOKS:

1. George, A., Antaki, *Piping and Pipeline Engineering-Design, Construction, Maintenance Integrity and Repair*, CRC Press, 2003.
2. Alkazraji,D.,*A Quick Guide to Pipeline Engineering*, Woodhead Publishing, 2008.
3. ShashiMenon,E., *Pipeline Planning and Construction Field Manual*, Gulf ProfessionalPublishing, 2011.
4. McAllister, E. W., *Pipeline Rules of Thumb Handbook,* 7th Edition, 2009.

ADDITIONAL LEARNING RESOURCES:

1. ShashiMenon, E., *Liquid Pipeline Hydraulics,* Mareel Dekker, Inc., 2004.
2. SkonbergEric, R.,and Tennyson, M., Muindi, *Pipeline Design for Installation by Horizontal Directional Drilling,* American Society of Civil Engineers, 2014.

III B. Tech. – I Semester

(20BT50131) COMPUTER AIDED BUILDING PLANNING AND DRAWING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Course on Civil Engineering Materials and Concrete Technology, Construction, Planning and Project Management.

COURSE DESCRIPTION: Exercises on Conventional signs and symbols used in building drawing; Planning and computer aided drawing of Load bearing walls, RCC framed structures andindustrial buildings.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze conventional signs and symbols used in building drawing using Auto CAD following relevant standards.
CO2. Develop complex2D plans, elevations and sections of doors, windows, isolated footings, buildings and RCC framed structures using AutoCAD by adopting building bye-laws and principles of planningconsidering safety, serviceability andenvironment.
CO3. Develop complex2D sectional views of various trusses using AutoCAD by adopting building bye-laws considering safety and serviceability.
CO4. Develop complex 3D perspective views of one and two storey buildings using Auto CAD by adopting building bye-laws.
CO5. Perform individually or in a team besides communicating effectively in written, oral and graphical forms in connection with building planning and drawing.

Mapping of COs with Pos and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	1	3			3			1					3		
CO2	6	2	2	3	2	3	1	2	2					3		
CO3	6	2	2	3	2	3	1		2					3		
CO4	6	2	2	3	2	3	1		2					3		
CO5	4									3	3			3		
Average		1.75	2.25	3	2	3	1	2	1.75	3	3			3		
Course Correlation Level		2	3	3	2	3	1	2	2	3	3			3		

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

SOFTWARE: AutoCAD

LIST OF EXERCISES:

1. Conventional signs in building drawing
2. Elevation and sectional view of doors
3. Elevation and sectional view of windows
4. Sectional view of Isolated footings
5. Plan, elevation and sectional views of building (Load bearing wall structure)
6. Plan, section and elevation of RCC framed structures
7. King post truss with details
8. Queen post truss with details
9. North light roof truss with details
10. Perspective view of one storey buildings
11. Perspective view of two storey buildings

TEXT BOOKS:

1. Varma B. P., *Civil Engineering Drawing and House Planning,* Khanna Publishers, 12thEdition, 2006.
2. Balagopal and Prabhu, T. S.,*Building Design and Civil Engineering Drawing*, Spades Publishers, 2012.

REFERENCE BOOKS:

1. Shah, M. G., Kale, C. M., and Patki. S, Y., *Building Drawing with an Integrated Approach to Built Environment*, Tata McGraw–Hill, 5th Edition, 2012.
2. Kumaraswamy N. and KameswaraRao A., *Building Planning and Drawing*, Charotar Publishing House Pvt. Ltd., 9th Edition, 2019.
3. Natarajan, K. V.,*A Text Book of Engineering Graphics*, N. Dhanalakshmi Publishers, 21st Edition, 2018.
4. Bhavikatti, S. S., & Chitawadagi, M.V., *Building Planning and Drawing,* I.K. International Publishing House Pvt. Ltd., 2014.

LABORATORY MANUALS:

1. *Computer Aided Building Planning and DrawingLaboratory Manual (SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

CODES

SP 7 Group I – 2016 : National Building code of India
SP 27 – 2013 : Handbook for method of measurement of building works
SP 62 – 1997 : Handbook on Building Construction Practices

III B. Tech. – I Semester

(20BT50132)**TRANSPORTATION ENGINEERING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Course on Transportation Engineering

COURSE DESCRIPTION: Highway material testing – Aggregates, Bituminousmaterials, Bituminous mixes; Pavement evaluation; Traffic studies.

COURSE OUTCOMES: After successful completion of the course, students will be ableto:

CO1. Evaluate road aggregates using different tools and techniques to solve complex highway engineering problems following relevant codes of practice and latest trends ensuring safety and environment.

CO2. Evaluate bituminous materials using different tools and techniques to solve complex highway engineering problems following relevant codes of practice and latest trends ensuring safety and environment.

CO3. Design bituminous mix for pavements using different tools and techniques to solve complex highway engineering problems following relevant codes of practice and latest trends ensuring safety, environment and sustainability.

CO4. Evaluate pavements using different tools and techniques to solve complex highway engineering problems following relevant codes of practice and latest trends ensuring safety and environment.

CO5. Evaluate macroscopic and microscopic parameters of traffic using different tools and techniques to solve complex traffic engineering problems following relevant codes of practice and latest trends ensuring safety and environment.

CO6. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on transportation engineering.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	2	3	-	1	1	1	1	2	1	1	-	1	-	3	-
CO2	5	2	3	-	1	1	1	1	2	1	1	-	1	-	3	-
CO3	6	2	2	3	1	1	1	1	2	1	1	-	1	-	3	-
CO4	5	2	3	-	1	1	1	1	2	1	2	-	1	-	3	-
CO5	5	2	3	-	1	1	1	1	1	1	1	-	1	-	3	-
CO6	4	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-
Average		2.00	2.80	3.00	1.00	1.00	1.00	1.00	1.80	1.33	1.50	-	1.00	-	3.00	-
Course Correlation Level		2	3	3	1	1	1	1	2	2	2	-	1	-	3	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

LIST OF EXPERIMENTS:

(A) AGGREGATES

1. Sieve analysis of aggregates
2. Shape test and angularity number test for coarse aggregate
3. Aggregate crushing value test and 10% fines value
4. Aggregate impact test
5. Attrition test for coarse aggregate
6. Abrasion test for coarse aggregate
7. Specific gravity and water absorption test

(B) BITUMINOUS MATERIALS

8. Penetration test
9. Ductility test
10. Softening point test
11. Flash and fire point test
12. Viscosity test
13. Specific gravity test

(C) BITUMINOUS MIXES

14. Marshall stability test on Marshall bituminous mix design
15. Stripping value test of coated bituminous mix
16. Theoretical maximum specific gravity (G_{mm}) of bituminous mix test
17. Bitumen extraction and determination of bitumen content and gradation of aggregates

(D) PAVEMENT EVALUATION

18. Field CBR test for subgrade strength
19. Benkelman beam deflection studies on flexible pavement and analysis
20. Measurement of unevenness/roughness by MERLIN or Bump Integrator

(E) TRAFFIC STUDIES

21. Spot speed studies
22. Traffic volume studies atmid-block section and at typical intersections

TEXT BOOKS:

1. Khanna, S.K. Justo, C. E. G., and Veeraragavan, A., *Highway Materials and Pavement Testing*, Nem Chand & Bros, Roorkee, Revised 5th Edition, 2009.
2. Khanna, S. K.and Justo, C. E. G., *Highway Engineering,* Nem Chand & Bros, Roorkee, Revised 10th Edition, 2014.

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Transportation EngineeringLaboratory Manual (SVEC19 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.
2. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.

ADDITIONAL LEARNING RESOURCES:

1. Athanassios Nikolaides, *Highway Engineering: Pavements, Materials and Control of Quality*, Taylor and Francis Group, LLC, 1st Edition, 2017.

CODES:

IS2386-1963(Part I to IV) : Methods of Test for Aggregates for Concrete.
IS 1201-1220 (1978) : Methods for Testing Tar and Bituminous Materials.

III B.Tech. – I Semester

(20BT50133)**MATLAB PRACTICE FOR CIVIL ENGINEERS**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
70	30	100	-	1	2	2

PRE-REQUISITES: Course onMathematics at Intermediate Level andPrinciples of Computer Programming.

COURSE DESCRIPTION: Exercises on MATLAB Basics; Control Structures; Arrays; Functions and Files; Programming Techniques; Plotting; Polynomials; Linear Algebraic Equations; Simulink; Solving civil engineering problems using MATLAB; Demonstration on toolboxes for specific civil engineering applications.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. AnalyzeMATLAB tools to solve complex engineering problemsby following current developments.
CO2. Design solutions for complex engineering problems using MATLABtoolsfollowing latest developments.
CO3. Design solutions for complex civil engineering problems using MATLAB programming and simulation, following latest developments.
CO4. Develop solutions for complex civil engineering applications using MATLAB tool boxes, following latest developments.
CO5. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on civil engineering materials and construction technology.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		3	3							2	3		
CO2	6	2	2	3	3	3							2	3		
CO3	6	2	2	3	3	3							2	3		
CO4	6	2	2	3	3	3							2	3		
CO5	4									3	3			3		
Average		2	2.25	3	3	3				3	3		2	3		
Course Correlation Levels		2	3	3	3	3				3	3		2	3		

Correlation Levels: 3 - High 2 – Medium 1 – Low

DETAILED SYLLABUS:

LIST OF EXERCISES:

1. BASICS OF MATLAB

1. MATLAB Windows
2. Help
3. Input and Output
4. File types

5. Variables and Keywords
6. Arithmetic Operations on Scalars
7. Order by Precedence
8. Working with MATLAB User Interface

2. CONTROL STRUCTURES

9. If, If ——Else If
10. While
11. For
12. Switch

C) MATRICES

13. Generation of Row/Column Vector
14. Generation of 2 Dimensional/Multidimensional Matrix
15. Arithmetic Operation on Arrays
16. Determination of Eigen Vector and Eigen Values of a Matrix
17. Determination of Rank of the Matrix
18. Automating Commands through Scripts

D) GRAPHICS

19. 2D Plot
20. 3D Plot
21. Mesh Plot and Surface Plots
22. Plotting of Wave Forms: Triangle, Square, Sine, etc.

E) POLYNOMIALS

23. Determination of Roots of a Polynomial Equation
24. Arithmetic Operations on Polynomials
25. Least Square Curve Fitting
26. Interpolation

F) ALGEBRA, DIFFERENTIATION AND INTEGRATION

27. Determine the Solution of Linear and Non-Linear Equation
28. Determine the Solution for the First-Order and Higher-Order Differential Equations
29. Determine the Solution for Single Variable and Two Variable Integration
30. Determine the Summation of Infinite and Finite Series

G) SIMULINK

31. Basics of Simulink
32. Simulink Model to Solve an Equation
33. Simulink Model to Solve Support Reaction of a Beam

H) SOLVING CIVIL ENGINEERING PROBLEMS USING MATLAB

34. Centroid of Triangle
35. Beam Element Analysis to Determine Slope and Deflection
36. Column Element Analysis to Determine Buckling Load
37. Mohr's Circle to Predict Shear Stress in Soil Elements
38. Hardy Cross Method to Calculate Flow in Pipe Networks
39. Design of Flexible Pavement using CBR Method

I) DEMONSTRATION ON TOOLBOXES FOR SPECIFIC CIVIL ENGINEERING APPLICATIONS

40. Structural Analysis using Matrices
41. Ground Parameter Prediction using Statistical Toolbox
42. Creating Hydrological Data using Optimization Toolbox
43. Pavement Modelling using Fuzzy Logic Toolbox
44. Ground Water Modelling by Neural Networks

TEXT BOOKS:

1. Raj Kumar Bansal, Ashok Goel, Manoj Kumar Sharma, *MATLABand its Applications in Engineering*, Pearson Education, 2012.
2. Rudra Pratap, *Getting Started with MATLAB: A QuickIntroduction for Scientists and Engineers*, Oxford UniversityPress, New York, 2010.

REFERENCE BOOKS:

1. Amos Gilat, *MATLAB-An Introduction with Applications*, Wiley India.
2. Stephen J.Chapman, *Programming in MATLAB for Engineers*, Cengage Learning, 2011.
3. Math Works Tool Boxes, http://in.mathworks.com/support/ documentation.

ADDITIONAL LEARNING RESOURCES

1. Edward B. Magrab, Shapour Azarm, Balakumar Balachandran, James Duncan, Keith Herold, Gregory Walsh, *An Engineer's Guide to MATLAB, 3e: with Applications from Mechanical, Aerospace, Electrical, and Civil Engineering*, Prentice Hall, 2011.
2. Sergey E. Lyshevski, *Engineering and Scientific Computations Using MATLAB*, Wiley Interscience.

III B.Tech. - I semester

(20BT50134) **SUMMER INTERNSHIP-I**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	1.5

PREREQUISITES: -

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer's responsibilities and ethics; Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.

CO2. Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solvingcomplex engineering problems.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.

Mapping of COs with POs and PSOs:

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		3	3			3				3	3	3	3
CO2	4		3				3	3				3		3	3	3
CO3	4									3	3			3	3	3
Average		3	3		3	3	3	3	3	3	3	3	3	3	3	3
Course Correlation Level		3	3		3	3	3	3	3	3	3	3	3	3	3	3

Correlation Levels: 3: High 2: Medium 1: Low

III B.Tech. I Semester

(20BT503AC) **FOUNDATIONS OF ENTREPRENEURSHIP**
(Audit Course)

(Common to CE, ME, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	2	-	-	-

COURSE PREREQUISITES: -

COURSE DESCRIPTION:

The nature and growth of entrepreneurship; Characteristics of an entrepreneur; Types of Entrepreneurs;Ethics and social responsibility of entrepreneurs;Generating ideas; Opportunity identification; Implementing and managing the venture; Principles of creativity and innovation; Methods of protecting innovation and creativity; Market research; Feasibility analysis;Sources of funding;Preparation of business plan;Start-Ups;Social Entrepreneurship; Rural entrepreneurship.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge on personal attributes that enable best use of entrepreneurial opportunities.
CO2. Apply suitable method to protect creativity and innovation.
CO3. Design and prepare high impact strategic and business plan.
CO4. Analyze the major steps and requirements in order to convert innovative idea into a successful start-up.
CO5. Develop an idea to create a business for social change by identifying social entrepreneurship opportunities.

Mapping of COs with POs and PSOs:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	1	-	1	-	-	1	-			
CO2	3	2	1	-	-	1	-	1	-	-	1	-			
CO3	3	2	2	-	-	2	-	1	-	-	-	-			
CO4	3	3	1	-	-	2	-	1	-	-	3	-			
CO5	3	2	1	-	-	2	-	1	-	-	1	-			
Average	3	2.2	1.2	-	-	1.6	-	1	-	-	1.5	-			
Correlation level	3	2	1	-	-	2	-	1	-	-	2	-			

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS

UNIT–I: ENTREPRENEURIAL MINDSET (06 Periods)

The nature and growth of entrepreneurship, Entrepreneurship and Intrapreneurship, Characteristics of an entrepreneur, Types of Entrepreneurs, Women as an Entrepreneur,

Factors that contribute to the success of entrepreneurs, Ethics and social responsibility of entrepreneurs.

UNIT–II: **ENTREPRENEURIAL PROCESS (06 Periods)**

Generating ideas, Opportunity identification, Business concepts, Resources (Financial, Physical and Human), Implementing and managing the venture, Harvesting the venture, Harvesting strategies: Absorption of new concept into mainstream operations, Licensing of rights, Family succession, Liquidate (Shut down) venture, Selling the venture, Management Buy-Out (MBO).

UNIT–III: CREATIVITY AND INNOVATION (06 Periods)

Principles of creativity and innovation, Disruptive, incremental and open innovations, Nurturing and managing innovation, Methods of protecting innovation and creativity: Intellectual property rights, Branding, Trademarks, Patents, Copyrights, Registered design protection, Trade secrets.

UNIT–IV: NEW VENTURE PLANNING AND CREATION (06 Periods)

Market research (venture opportunity screening), Feasibility analysis, Start-up capital; Sources of funding: equity financing, debt financing (loans, venture funding, angel funding), grants, gifts, bequests and financial statements, Introduction to the business plan, Preparation of business plan.

UNIT–V: Start-Ups and Social Entrepreneurship (06 Periods)

Start-Ups: Definition to start-up, Start-up activities, Promising start-ups, Venture-backed start-ups, Corporate-supported start-ups.

Social Entrepreneurship: Social enterprise-Need - Types - Characteristics and benefits of social enterprises, Rural entrepreneurship.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Robert D. Hisrich, Mathew J. Manimala, Michael P. Peters, Dean A. Shepherd, *Entrepreneurship*, McGraw Hill Education (India) Private Limited, Eighth Edition, 2013.
2. Marc J Dollinger, Entrepreneurship: Strategies and Resources, Pearson, Third Edition, 2003.

REFERENCE BOOKS:

1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management,* Himalaya Publ. House, 2004.
2. *Harvard Business Review on Entrepreneurship,* HBR Paper Back.
3. Thomas W. Zimmerer& Norman M. Scarborough, *Essential of Entrepreneurship and small business management,* PHI.

III B.Tech. - II Semester

(20BT5HS01) **ORGANIZATIONAL BEHAVIOR**

(Common to CE, EEE, ECE and EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITE:-

COURSE DESCRIPTION: Introduction to organizational Behavior; Individual behavior and Personality; Interpersonal and group behavior; Leadership; Organizational change and development

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the nature, issues and challenges of Organizational Behaviour.
CO2. Demonstrate the concepts of behavior and theories of personality to assess the behavior of people in an organization
CO3. Demonstrate the Interpersonal and Group Behaviour in an Organization.
CO4. Apply the theories of Leadership to develop leadership qualities in an Organization.
CO5. Apply the techniques of Organization development in the process of Organizational change and development.

Mapping of COs with POs and PSOs:

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	2	-	-	-
CO3	3	-	-	-	-	-	-	-	2	-	-	-
CO4	2	3	-	-	-	-	-	-	2	-	-	-
CO5	1	3	-	-	-	-	-	-	1	-	-	-
Average	2.4	2.25	-	-	-	-	-	-	1.75	-	-	-
Course correlation levels	3	2	-	-	-	-	-	-	2	-	-	-

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT–I: INTRODUCTION TO ORGANIZATIONAL BEHAVIOR (9 Periods)

Meaning and Definition, Nature, Scope, Features, Significance of Organizational Behavior – Levels and Contributing disciples to OB – Emerging Issues and Challenges of OB

UNIT–II: INDIVIDUAL BEHAVIOR AND PERSONALITY (9 Periods)

Individual: Introduction – Role of Brain and Mind in Individual Behavior – Similarities and Dissimilarities in Individuals – Reasons for individual differences – Nature of Man – Models of man – Values, Attitudes, emotions, Moods and Job satisfaction.

Personality: Introduction– Personality Traits – Determinants of Personality – Personality Theories**.**

UNIT–III: INTERPERSONAL AND GROUP BEHAVIOR (9 Periods)
Introduction To Interpersonal: Process of perception – Inter personal perception.
Group Behavior: Meaning and Definition of a Group – Classification of Groups – Stages of Group development.

NIT–IV: LEADERSHIP (9 periods)
Meaning and Definition of Leadership – Leadership Theories: Behavioral Theories and Modern theories – Leadership Styles – New directions for leadership.

UNIT–V: ORGANIZATIONAL CHANGE AND DEVELOPMENT (9 periods)
Meaning – Nature of work change – Pressure for change – Change Process – Types of change – Factors influencing change – Organizational development process – Organizational Development interventions/Techniques.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Stephen P. Robbins, Timothy A. Judge and Neharika Vohra, *Organizational Behavior*, Pearson, Noida, 16th edition, 2017.
2. P.Subba Rao, *Management and Organizational behavior*, Himalaya Publishing House, Mumbai, Re-print 2019.

REFERENCE BOOKS:

1. Fred Luthans, *Organizational behavior*, McGraw Hill Higher Education, 10th edition, 2016.
2. Shashi K. Gupta and Rosy Joshi, *Organizational Behavior*, Kalyani Publications, 8th edition, 2017.

III B.Tech. – II Semester

(20BT60101) IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Fluid Mechanics, Hydraulic Engineering, Engineering Hydrology.

COURSE DESCRIPTION: Irrigation and water requirement of crops; Diversion head works; Gravity dams, earth dams and spillways; Canal structures; Cross drainage works.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze irrigation methods for estimating adequate irrigation water requirements considering latest developments, relevant standards, public health and safety, environment, sustainability, irrigation management besides communicating effectively in graphical form.

CO2. Analyze diversion head works for solving complex irrigation engineering problems using different techniques considering relevant codes of practice, safety, environment and sustainabilitybesides communicating effectively in graphical form.

CO3. Design gravity dams, earth dams and spillwaysfor solving complex irrigation engineering problems using different tools and techniques considering codes of practice, safety, environment and sustainabilitybesides communicating effectively in graphical form.

CO4. Design canal structures for solving complex irrigation engineering problems using different tools and techniques considering codes of practice, safety, environment and sustainabilitybesides communicating effectively in graphical form.

CO5. Design cross drainage works for solving complex irrigation engineering problems using different tools and techniques considering codes of practice, safety, environment and sustainabilitybesides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3			2	2	2	1		1	1	1			3
CO2	4	2	3		2	2	2	2	1		1					3
CO3	6	1	2	3	3	2	2	2	1		1					3
CO4	6	1	2	3	3	2	2	2	1		1					3
CO5	6	1	2	3	3	2	2	2	1		1					3
Average		1.40	2.40	3.00	3.67	2.00	2.00				1	1	1			3.00
Course Correlation Level		2	3	3	4	2	2	2	2		1	1	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT - I: IRRIGATION AND WATER REQUIREMENT OF CROPS (09 Periods)

Necessity and importance, Advantages and disadvantages,Types of irrigation, Application of irrigation water, Sources of water for irrigation, Standardsfor irrigation water, Soil–water–plant relationship, Verticaldistribution of soil moisture, Soil moisture constants,Consumptive use, Duty–delta relationship, Factors affectingduty, Crops and crop seasons in India, Irrigation efficiency, Frequency of irrigation, Irrigation scheduling – Water distribution – Participatory irrigation management with a case study, Latest developments in irrigation.

UNIT - II: DIVERSION HEAD WORKS (09 Periods)

Types of diversion head works – Weirs, Barrages; Layout of diversion works, Causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory, Khosla's theory -Design principles of various weirs.

UNIT - III: GRAVITY DAMS, EARTH DAMS AND SPILLWAYS (10 Periods)

Gravity Dams:Forces acting on gravity dam, Causes of failure of gravity dams, Elementary profile and practical profile of gravity dam, Limiting height of a low gravity dam, Stability analysis of gravity dam.

Earth Dams: Types, Causes of failure, Criteria for safe design, Seepage through earth dam, Measures of seepage control, Stability analysis.

***Spillways*:** Types, Design of Ogee spillway, Energy dissipaters –Types, Advantages and disadvantages.

UNIT - IV: CANAL STRUCTURES (09 Periods)

Types of canals, Alignment of canals, Lining of Canals, Design of canals, Kennedy's and Lacey's theory, Falls – Types, Design of Sarda type fall; Canal regulation works, Canal outlets – Types.

UNIT - V: CROSS DRAINAGE WORKS (08 Periods)

Types, Design and selection of site for aqueducts, super passages, level crossing; River training works.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Garg, S. K., *Irrigation Engineering and Hydraulic Structures*, Khanna Publishers, 36th Edition, 2019.
2. Modi, P. N., *Irrigation Water Resources and Water Power Engineering,* Standard Book House, 22ndEdition, 2019.

REFERENCE BOOKS:

1. Arora, K. R., *Irrigation, Water Power a*nd *Water Resources Engineering*, Standard Publishers Distributers, 4th Revised Edition, 2014.
2. Asawa, G. L.*, Irrigation a*nd *Water Resources Engineering,* New Age International Limited, 2012.
3. Sharma, R. K. and Sharma, T. K., *Irrigation Engineering,* S. Chand Publishers, 3rd Edition, 2007.
4. Punmia, B. C. and Lal, P. B. B.*, Irrigation and Water Power Engineering,* Laxmi Publications, 16th Edition, 2011.

ADDITIONAL LEARNING RESOURCES:

1. Chen Sheng-Hong, *Hydraulic Structures*, Springer-Verlag Berlin Heidelberg, 1st Edition, 2015.
2. Jose LiriaMontanes, *Hydraulic Canals: Design, Construction, Regulation and Maintenance*, CRC Press, 1st Edition, 2005.

CODES:

IS: 6512 – 1984 : Criteria for Design of Solid Gravity Dams, 1st Edition, 1998.

IS: 9429 – 1999 :Drainage System for Earth and Rockfill Dams - Code of Practice, 1stEdition, 1999.

IS: 4839– 1992 : Maintenance of Canals-Code of Practice, 1st Edition, 1992.

III B. Tech. – II Semester

(20BT60102) **STEEL STRUCTURES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses onEngineering Mechanics, Mechanics of Solids, Structural Analysis.

COURSE DESCRIPTION: Bolted connections; Welded connections; Beams; Tension members; Compression members; Built-up compression members; Column foundations; Roof trusses; Tubular trusses.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Designbolted and welded connections to solve complex problems associated with steel structures using appropriate techniques following relevant codes considering safety and stability besides communicating effectively in graphical form.

CO2. Designsteel beams to solve complex problems associated with steel structures using appropriate techniques following relevant codes and steel tables considering safety and serviceability besides communicating effectively in graphical form.

CO3. Designsteel tension and compression members to solve complex problems associated with steel structures using appropriate techniques following relevant codesand steel tables considering safety and stability besides communicating effectively in graphical form.

CO4. Designsteel built-up compression members and column foundations to solve complex problems associated with steel structures using appropriate techniques following relevant codesand steel tables considering safety and stability besides communicating effectively in graphical form.

CO5. Design steel roof trusses and tubular trusses to solve complex problems associated with steel structures using appropriate techniques following relevant codes considering safety and stability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	1	2	3	2	1	2		2		2			3		
CO2	6	1	2	3	2	1	2		2		2			3		
CO3	6	1	2	3	2	1	2		2		2			3		
CO4	6	1	2	3	2	1	2		2		2			3		
CO5	6	1	2	3	2	1	2		2		2			3		
Average		1	2	3	2	1	2		2		2			3		
Course Correlation Level		1	2	3	2	1	2		2		2			3		

Correlation Levels: 3: High 2: Medium 1: LowDETAILED

DETAILED SYLLABUS:

UNIT- I: BOLTED AND WELDED CONNECTIONS (09 periods)

***Bolted Connections*:** Strength and efficiency of a joint, Lap Joint, Butt joint, Eccentric connections.
***Welded Connections*:**Strength of welds, Butt and fillet welds, Design of fillet welds subjected to axial load, Design of fillet welds subjected to moment acting in the plane and at right angles to the plane of the joints, Beam to beam and beam to column connections.

UNIT- II:BEAMS (09 periods)
Bending, Shear and bearing strength, Design of simple beams, Design of compound beams, Design of connection of cover plates with the flanges of beams.

UNIT-III: TENSION AND COMPRESSION MEMBERS (09 periods)
***Tension Members*:** Net effective sectional area for angle and tee sections, Design of tension members, Lug angles.

***Compression Members*:** Effective length, Radius of gyration and slenderness of compression members, Design strength, Design of axially loaded compression members.

UNIT-IV: BUILT–UP COMPRESSION MEMBERS AND COLUMN FOUNDATIONS (09 periods)
***Built–up Compression Members*:** Design of built–up compression members, Design of lacings and battens, Design principles of eccentrically loaded columns, Splicing of columns.

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

UNIT-V: ROOF AND TUBULAR TRUSSES (09 periods)
***Roof Trusses*:** Different types of trusses, Design loads, Load combinations, IS Code recommendations, Structural details, Design of simple roof trusses involving the design of purlins, members and joints.

***Tubular Trusses*:** Design of tension members, compression members andconnections.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Bhavikatti,S. S.,*Design of Steel Structures*, I. K. International Publishing House Pvt. Ltd., 5thEdition, 2017.
2. Ram Chandra, Virendra Gehlot, *Limit State Design of Steel Structures LSD:SS*, Scientific Publishers, 11th Edition,2017.

REFERENCEBOOKS:

1. Subramanian, N., *Design of Steel Structures Limit State Method*, Oxford University Press, 2nd Edition, 2018.
2. Duggal, S. K., *Limit State Design of Steel Structures*, Mc.Graw Hill, 3rd Edition, 2019.
3. Ramachandra, S.,*Design of Steel Structures*, Dhanpat Rai Publishing Company, 2nd Edition, 2016.
4. Punmia,B.C., Ashok Kumar Jain and ArunKumar Jain, *Design of Steel Structures,* Laxmi Publications,2nd Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Segui, W.T., *Design of Steel Structures*, Cengage Learning, 2007.
2. Alan Williams, *Steel Structures Design*, Mc Graw Hill, 2011.
3. Narayanan, R.,*Teaching Resource on Structural Steel Design*, INSDAG, Ministry of Steel Publishing, 2000.
4. *Design Manual For Designing Steel Structures According to New IS: 800*, Institute for Steel Development & Growth, India.
5. *Handbook of Structural Steel Wok*, BCSA and SCI.

III B. Tech. – II Semester

(20BT60103) **ADVANCED STRUCTURAL ANALYSIS**

(Professional Elective - 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses onEngineering Mechanics, Mechanics of Solids, Structural Analysis

COURSE DESCRIPTION: Flexibility method; Stiffness method;Portal frames; Approximate method; Redundant pin–jointed frames;Two hinged arches; Three hinged arches; Cables and suspension bridges.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze continuous beams to solve complex structural analysis problems using matrix methods besides communicating effectively in graphical form.
CO2. Analyze portal frames to solve complex structural analysis problems using appropriate methods besides communicating effectively in graphical form.
CO3. Analyze redundant pin-jointed plane trusses to solve complex advanced structural analysis problems using Castigliano's theorem besides communicating results effectively in graphical form.
CO4. Analyze three hinged and two hinged arches to solve complex advanced structural analysis problemsusing appropriate techniques ensuring safety and environment.
CO5. Analyze cables and suspension bridgesto solve complex advanced structural analysis problemsusing appropriate techniques ensuring safety and environment.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		2	2					1			3		
CO2	4	2	3		2	2					1			3		
CO3	4	2	3		2	2					1			3		
CO4	4	2	3		2	2	1	1						3		
CO5	4	2	3		2	2	1	1						3		
Average		2	3		2	2	1	1			1			3		
Course Correlation Level		2	3		2	2	1	1			1			3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT - I: MATRIX METHODS (09 periods)

Flexibility Method: Flexibility coefficients, Flexibility matrices, Application to continuous beams without and with settlement of supports.

Stiffness Method: Stiffness coefficients, Stiffness matrices, Application to continuous beams without and with settlement of supports.

UNIT – II: PORTAL FRAMES (09 Periods)

Analysis of single bay, single storey, portal frame including side sway;Shear force andbending moment diagrams by slope deflection method, moment distribution method and Kani's method.

UNIT - III: APPROXIMATE METHODSAND REDUNDANT PIN–JOINTED FRAMES (09 Periods)

Approximate Methods:Analysis of multi-storey frames for lateral loads using portal and cantilevermethods.

Redundant Pin–Jointed Frames: Indeterminate frames, Static and kinematic indeterminacies, Castigliano's theorem, Analysis of pin–jointed frames up to two degrees of internal and external indeterminacies.

UNIT – IV: ARCHES (09 Periods)

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

Two Hinged Arches: Determination of horizontal thrust bending moment, normal thrust and radial shear; Rib shortening and temperature stresses, Tied arches, Fixed arches(No analytical question).

UNIT - V: CABLES AND SUSPENSION BRIDGES (09 Periods)

Basic concepts, Suspension cables, Reactions, Tension and length of suspension cable; Effect of change in temperature, Suspension bridges with two and three stiffening girders.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Vaidyanathan, R. and Perumal, P., *Structural Analysis- Vol. I and II*, Laxmi Publications,4th Edition, 2016.
2. Vazirani, V. N., Ratwani, M. M. and Duggal, S. K., *Analysis of Structures– Vol. I and Vol. II*, Khanna Publications, 17th Edition, 2013.

REFERENCE BOOKS:

1. Bhavikatti S. S., *Structural Analysis– Vol. I and II,* Vikas Publishing House Pvt. Ltd.,4th Edition, 2010.
2. Thandavamoorthy, T. S., *Structural Analysis*, Oxford University Press, 5th Edition, 2011.
3. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *SMTS–II –Theory of Structures*, Laxmi Publications (P) Ltd., 12th Edition, 2004.
4. Khurmi, R. S., *Theory of Structures*, S. Chand & Company Ltd., 22nd Edition, 2010.

ADDITIONAL LEARNING RESOURCES:

1. Pandit, G., Gupta, S. and Gupta, R., *Theory of Structures – Vol. II*, Tata Mc–Graw Hill Publishing Co. Ltd., 1st Edition, 1999.
2. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, Dhanpat Rai Publishing Co. Ltd., 9th Edition, 2014.
3. Shah, H. J. and Junnarkar, S. B., *Mechanics of Structures – Vol. II*, Charotar Publishing House, 21st Edition, 2010.

III B.Tech. – II Semester

(20BT60104) **ADVANCED SURVEYING**

(Professional Elective -1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Matrices and Numerical Methods,Engineering Physics, Surveying.

COURSE DESCRIPTION: Astronomical surveying; Constructionand boundary surveys; Theory of errors; Land surveys;Triangulation and baseline measurements; GPS surveying.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze astronomical surveying techniques for measuring azimuth, distances, angles and coordinates to solve complex surveying problems using appropriate tools and techniques by following ethics andconsidering society, environment besides communicating effectively in graphical form.

CO2. Analyze construction and boundary surveys to solve complex surveying problems using appropriate tools and techniques by following ethics andconsidering society, environment besides communicating effectively in graphical form.

CO3. Analyze errors in surveying to solve complex surveying problems using appropriate tools and techniques by following ethics andconsidering society, environment besides communicating effectively in graphical form.

CO4. Develop layouts of land surveys to solve complex surveying problems using appropriate tools and techniques by following ethics and considering, societyand environment besides communicating effectively in graphical form.

CO5. Analyze triangulation and baseline measurementsto solve complex surveying problems using appropriate tools and techniques by following ethics andconsidering society, environment besides communicating effectively in graphical form.

CO6. Analyze GPS surveyingto solve complex surveying problems using appropriate tools and techniques by following ethics andthrough continuous learningconsidering society by ensuring environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		2	2	1	1	1		1					3
CO2	4	2	3		2	2	1	1	1		1					3
CO3	4	2	3		2	2	1	1	1		1					3
CO4	6	1	2	3	2	2	1	1	1		1					3
CO5	4	2	3		2	2	1	1	1		1					3
CO6	4	2	3		2	2	1	1	1		1		1			3
Average		1.83	2.83	3.00	2.00	2.00	1.00	1.00	1.00		1.00		1.00			3.00
Course Correlation Level		2	3	3	2	2	1	1	1		1		1			3

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT - I: ASTRONOMICAL SURVEYING (08 Periods)
Astronomical coordinate systems, Terrestrial coordinate systems, Astronomical triangle, Determination of azimuth, Determination of latitude and longitude, Time correlations.

UNIT - II: CONSTRUCTION AND BOUNDARY SURVEYS (10 Periods)
Construction Surveys: Specialized equipment for construction surveys, Staking out pipe line, Staking out buildings, Staking out highways, Construction surveys using total station and GNSS equipment, Sources of errors and mistakes in construction surveys.
Boundary Surveys: Categories of land surveys, Property description - By metes and bounds, By block and lot system and by coordinates; Retracement surveys, Partitioning land, Sources of errors and mistakes in boundary surveys.

UNIT -III: THEORY OF ERRORS AND LAND SURVEYS (09 Periods)

Theory of Errors: Types and sources of errors, Loss of accidental errors, Loss of weights, Theory of least squares, Method of weights, Method of correlates, Angle and station adjustment, Figure adjustment.
***Land Surveys*:**Layouts, Measurements

UNIT - IV: TRIANGULATION AND BASELINE MEASUREMENTS (09 Periods)
Principle and classification oftriangulation systems, Selection of base line and stations, Orders of triangulation, Station marks, Signals, Towers, Baseline measurement - Rigid bars, Flexible apparatus, Problems; Satellite station and reduction to centre.

UNIT - V: GPS SURVEYING (09 Periods)
Principles of GPS surveying and methods, Components of GPS-Space segment, Receiver segment, User segment; Errors in observations and corrections, Mapping with GPS, Application of GPS, Advantages over conventional methods, DGPS, Latest advancements in GPS surveying.

Total Periods: 45

Topics for self-study are provided in lesson plan.

TEXT BOOKS:

1. Arora, K. R., *Surveying – Vol. III*, Standard Book House, 12thEdition, 2015.
2. Ghilani, C.D., *Elementary Surveying-An Introduction to Geomatics*, Pearson India Education Services Pvt. Ltd, 13th Edition, 2018.
3. Chandra,A. M.,*Higher Surveying*, New Age International (P) Limited Publishers, 3rd Edition, 2015.

REFERENCE BOOKS:

1. Duggal,S. K., *Surveying – Vol. I and II*, Tata McGraw–Hill Publishing Co. Ltd., 5th Edition, 2019.
2. Benton, A. R., and Taety, P. J.,*Elements of Plane Surveying*, McGraw Hill, 3rd Edition, 2010.
3. Punimia, B. C.,Ashok Jain, K and Jain,A.K.,*Surveying – Vol. II*, Laxmi Publications (P) Ltd, 16th Edition, 2016.
4. Kanetkar, T. P and Kulakarni,S. V., *Surveying and Leveling*, Vidyarthi Griha Prakasham, 24th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Venkatramaih,C.,*Textbook of Surveying*, Universities Press (India) Limited, Hyderabad, 2nd Edition, 2011.
2. Parkinson, B. W., Spilker, J. J., *Global Positioning System: Theory and Applications, Volume 1*, American Institute of Aeronautics and Astronautics, 1996.
3. Nathanson, J. A., Lanzafama, M.T and Philip Kissam, *Surveying Fundamentals and Practices*, Pearson Publications, 7th Edition, 2017.
4. Sickle, J.V., *GPS for Land Surveyors*, CRC Press, 4th Edition, 2015.

III B.Tech. - II Semester

(20BT60105) AIR AND NOISE POLLUTION AND CONTROL

(Professional Elective - 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course onEnvironmental Science

COURSE DESCRIPTION: Air and noise pollution; Effects of air and noisepollution;Sampling and analysis;Control methods and equipment;Air and noise pollution from industrial operations.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze air and noise pollution to solvecomplexenvironmentalproblems using appropriate tools and techniques considering society, health and environment besides communicatingeffectivelyingraphicalform.

CO2. Analyze the effects of air and noise pollution to solveenvironmentalproblems considering society, health, environment and economics besides communicatingeffectivelyingraphicalform.

CO3. Analyze air and noise sampling techniques to solvecomplexenvironmentalproblems using appropriate tools following relevant standards, codes and latest developments considering society, health and environment besides communicatingeffectivelyingraphicalform.

CO4. Analyze the air and noise pollution control methods and equipment to solvecomplexenvironmentalproblems following relevant standards and codes considering society, health, environment and economics besides communicatingeffectivelyingraphicalform.

CO5. Analyze the air and noise pollution from industrial operations to solvecomplexenvironmentalproblems following relevant standards, codes and regulations considering society, health, environment besides communicatingeffectivelyingraphicalform.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		1	1	3	3			1					3
CO2	4	2	3				3	3			1	1				3
CO3	4	2	3		1	3	3	3	2		1		1			3
CO4	4	2	3		1	3	3	3	2		1	1				3
CO5	4	2	3		1		3	3	2		1					3
Average		2	3		1	2.33	3	3	2		1	1	1			3
Course Correlation Level		2	3		1	3	3	3	2		1	1	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILEDSYLLABUS:

UNIT – I: AIR AND NOISE POLLUTION (08 Periods)

Scope and significance of air pollution,Episodes in India and other nations – Overview; Sources and classification of air pollutants, Meteorology and air pollution – Plume behavior, Wind rose; Dispersion theories and model, Stack height; Scope and significance of noise pollution.

UNIT – II: EFFECTS OF AIR AND NOISE POLLUTION (09 Periods)

Effects of air pollution on human health, animals and plants; Global effects of air pollution – Green house effect, Heat islands, Acid rains, Ozone holes; Economic effects of air pollution – Material damage; Art treasures in India and other countries;Effects of noise pollution on human health.

UNIT – III: SAMPLING AND ANALYSIS (09 Periods)

Classification, Stages and methods of sampling, Difficulties encountered, Instruments of sampling, Duration and location of sampling sites, Sampling - High volume filtration, Stack sampling techniques; Recent trends in sampling of stack emissions; Noise measurement methods and analysis.

UNIT – IV: CONTROL METHODS AND EQUIPMENT (10 Periods)

Analytical methods – Chemical, Instrumental and biological methods; Types of collection equipment – Settling chambers, Inertial separators, Cyclones, Bag Filters,Electrostatic precipitators, Scrubbers; Choice of equipment and economical aspects, Control of smoke, Gaseous contaminants, Odours and by process changes; Noise control methods and equipment.

UNIT – V:AIR AND NOISE POLLUTION FROMINDUSTRIAL OPERATIONS (09 Periods)

Air Pollution fromIndustrial Operations:Air pollution from major industrial operations – Mining, Cement industry, Petroleum refineries, Ferrous and non-ferrous metallurgical operations, Thermal power plants; National ambient air quality standards; Emission standards and air pollution indices.

Noise Pollution fromIndustrial Operations:Noise pollution from industrial operations and permitted noise levels as per the regulatory authority.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Rao, M.N. and Rao, H.V.N.,*Air Pollution*, Tata McGraw- Hill Education Pvt. Ltd., New Delhi, 19thEdition, 2010.
2. Thod Godish, *Air Quality*, Levis Publishers, Taylor and Francis Group, New Delhi, 4thEdition, 2003.
3. Wark, K. and Warner, C.F., Harper and Row, *Air Pollution: Its Origin and Control*, Addison–Wesley, New York, 3rdEdition, 1998.

REFERENCES:

1. Trivedy, R.K. and Goel,P.K.,*An Introduction to Air Pollution*, B.S.P. Books Pvt. Ltd., Hyderabad, 2ndEdition, 2005.
2. Crawford, M., *Air pollution Control Theory*, Tata McGraw-Hill, New Delhi, 1980.
3. Perkins, H. C.,*Air Pollution*, McGraw Hill Higher Education, Lincoln, United Kingdom, 1974.
4. Dara, S.S. and Mishra, D.D., *A Textbook of Environmental Chemistry and Pollution Control*, S. Chand Publishing, New Delhi, 2006.

ADDITIONAL LEARNING RESOURCES:

1. Murali Krishna, K.V.S.G.,*Air Pollution and Control*, Kousal and Co. Publications, New Delhi, 3rdEdition, 2008.
2. Padmanabha Murthy,B., Environmental *Meteorology*, I.K. Internationals Publishing House Pvt. Ltd., New Delhi, 2009.

III B.Tech. - II Semester

(20BT60106) ARCHITECTURE AND TOWN PLANNING

(Professional Elective – 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Construction, Planning and Project Management

COURSE DESCRIPTION: Architectural design and site planning; Building architecture and services; Town planning and structure; Land use planning; Regional planning and standards.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze architectural design and site planning to solve architectural problems using appropriate tools and techniques following relevant standards and regulations considering society, environment and sustainability.

CO2. Design the building architecture and services to solve complex architectural problems using appropriate tools and techniques following relevant standards, codes and regulations considering safety, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze town planning and structure to solve urban development problems using appropriate tools and techniques following relevant policies considering society, environment and sustainability.

CO4. Analyze and use planning to solve complex urban development problems using appropriate techniques following relevant policies considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze regional planning to solve complex urban and regional problems using appropriate techniques following relevant standards considering society, environment and sustainability besides communicating effectively in graphical form.

Mapping of Cos with Pos and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3			1	1	1	2					3		
CO2	6	3	2	3	1	1	1	1	3		1			3		
CO3	4	3	3			1	1	1	1					3		
CO4	4	3	3		2	1	1	1	1		1			3		
CO5	4	3	3		2	2	1	1	2		1			3		
Average		3	2.8	3	1.67	1.2	1	1	1.8		1			3		
Course Correlation Level		3	3	3	2	2	1	1	2		1			3		

Correlation Levels: 3: H – High 2: M – Medium 1: L – Low

DETAILED SYLLABUS:

UNIT – I: ARCHITECTURAL DESIGN AND SITE PLANNING (09 Periods)

Architectural design, analysis, integration of function and aesthetics; Introduction to basic elements and principles of design, Surveys, Site analysis, Development control, Layout regulations, Layout design concepts.

UNIT – II: BUILDING ARCHITECTURE AND SERVICES (09 Periods)

Residential, Institutional, Commercial and industrial, Application of anthropometry and space standards, Inter relationships of functions, Safety standards, Building rules and regulations, National building code, Integration of building services, Interiordesign, Man and environment interaction, Factors that determine climate, Characteristics of climate types, Design for various climate types, Passive and active energy controls, Green building concept.

UNIT – III: TOWN PLANNING AND STRUCTURE (09 Periods)

Planning concepts and processes, Objectives, Levels of planning in India and their interrelationship, Planning administration, Models of planning processes, Components of settlement structures, Models of urban structure; Demand and supply of land for urban use, Means and mechanism, Impact on urban structure, Goals of land policy.

UNIT – IV: LAND USE PLANNING (09 Periods)

Concept of land use, Locational attributes of land use, Land use planning information system, Activity system and choice of space qualities, System approach and physical planning, Approach to land use planning, Introduction to spatial planning at regional level, Choice theory and advocacy planning and their application action plan and its relevance, Development plan types, Scope and objectives, Principles of landscape design.

UNIT – V: REGIONAL PLANNING AND STANDARDS (09 Periods)

Planning practices in India, Method of identifying urban and regional problem, Setting of goals objectives and priorities, Performance standards, Spatial standards and standard for utilities, Classification of regions, Regionalization and delineation techniques for various types of regions, Cluster and factor analysis method.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Biswas Hiranmay, Principles of Town Planning and Architecture, Vayu Education of India, 2nd Edition, 2019.
2. Satish Chandra Agarwala, Architecture and Town Planning, Dhanpat Rai and Company, 2008.

REFERENCE BOOKS:

1. Pratap Rao, M., *Urban Planning Theory and Practice*, CBS Publishers & Distributors Pvt. Ltd., New Delhi, 1st Edition, 2019.
2. Hiraskar, G. K., *Fundamentals of Town Planning*, Dhanpat Rai & Sons, 2018.
3. Rangwala, S. C., *Town Planning*, Charotar Publishing House, 31st Edition, 2021.
4. Muthu Shoba Mohan, G., *Principles of Architecture*, Oxford University Press, New Delhi, 1st Edition, 2006.
5. Bandopadhyay, A., *Text Book of Town Planning*, Books and Allied, 2018.

ADDITIONAL LEARNING RESOURCES

1. Kulshrestha S.K., *Dictionary of Urban and Regional Planning*, Kalpaz Publications, New Delhi, 2006.
2. Faludi, Andreas, *Planning Theory*, Pergamon Press, 1973.

III B.Tech. – II Semester

(20BT60107) GROUND IMPROVEMENT TECHNIQUES

(Professional Elective – 1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: Courses onSoil Mechanics and Foundation Engineering.

COURSE DESCRIPTION: Scope of ground improvement; Methods of ground improvement; Drainage and dewatering; In–situ densification of granular soils and cohesive soils; Soil stabilization; Geosynthetics and Earth Reinforcement.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze ground improvement techniques to solve complex ground engineering problems through continuous learning considering safety, environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze drainage and dewatering techniquesto solve complex ground engineering problems considering safety, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze in-situ densification techniques of granular soils and cohesive soils to solve complex ground engineering problems by following the relevant codes of practice and ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze soil stabilization techniques to solve complex ground engineering problems by following the relevant codes of practice and ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze geosynthetics and earth reinforcement techniques to solve ground engineering problems through continuous learning considering safety, environment and sustainability besides communicating effectively in graphical form.

CO6. Design geosynthetic reinforced earth walls to solve complexstability problems associated with earth retaining structuresusing appropriate techniques and following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		2	2	1	1	2		2		2		3	
CO2	4	2	3		2	2	1	1	2		2				3	
C03	4	2	3		2	2	1	1	2		2				3	
CO4	4	2	3		2	2	1	1	2		2				3	
CO5	4	2	3		2	2	1	1	2		2		2		3	
CO6	6	2	2	3	2	2	1	1	2		2		-		3	
Average		2	2.83	3	2	2	1	1	2		2		2		3	
Course Correlation Level		2	3	3	2	2	1	1	2		2		2		3	

Correlation Levels: 3: H - High 2: M - Medium 1: L– Low

DETAILED SYLLABUS:

UNIT – I:GROUND IMPROVEMENT (08 Periods)
Role of ground improvement in foundation engineering, Methods of ground improvement, Geotechnical problems in alluvial, laterite and black cotton soils; Selection of suitable ground improvement techniques based on soil condition; Latest Methods.

UNIT – II: DRAINAGE AND DEWATERING (09 Periods)
Drainage techniques, Well points, Vacuum and electroosmotic methods, Dewatering after construction, Control of surface water, Well pointing in deep excavation, Drainage on slopes, Electro kinetic dewatering system.

UNIT – III: IN-SITU DENSIFICATION OF GRANULAR SOILS AND COHESIVE SOILS (10 Periods)
Granular Soils: Principles of in-situ densification, In-situ densification methods – Dynamic compaction, Blasting, Vibro compaction, Granular piles, Relative merits and their limitations.

Cohesive Soils: Principles of in-situ densification, In-situ densification methods – Vertical drains, Sand wick, Geodrains, Stone columns, Granular pile anchors, Lime columns and thermal methods, Relative merits and their limitations.

UNIT – IV: SOIL STABILIZATION (09 Periods)
Soil Stabilization – Mechanical, Bitumen, Cement, Lime, Fly ash and Chemical; Stabilization of expansive soils; Soil stabilization by grouting - Types of grouts, Grouting equipment and machinery, Injection methods, Grout monitoring; Shotcreting and guniting technology.

UNIT – V: GEOSYNTHETICS AND EARTH REINFORCEMENT (09 Periods)
Concept of reinforcement, Types of reinforcement material, Components and applications of reinforced earth, Soil nailing, Geosynthetics – Types, Functions, Applications; Design of geosynthetic reinforced earth walls; Latest developments in earth reinforcement techniques.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Hausmann, M.R., *Engineering Principles of Ground Modification,* McGraw–HillPublishers, 2013.
2. Purushotham Raj, P., *Ground Improvement Techniques,*Laxmi Publications Pvt. Ltd., 2nd edition, 2016.

REFERENCE BOOKS:

1. Moseley, M.P. and Kirsch. K., *Ground Improvement,* Taylor Francis Ltd., 2nd Revised Edition, 2004.
2. Xanthakos P.P., Abramson, L.W and Bruce, D.A., *Ground Control and Improvement,* John Wiley and Sons, 1994.
3. Koerner, R. M., *Designing with Geosynthetics,Xlibris*Publishers*,* 6th Edition, 2012.
4. Jewell, R.A., *Soil Reinforcement with Geotextiles (Report),* CIRIA Special Publication, 1996.

ADDITIONAL LEARNING RESOURCES:

1. Chattopadhyay, B. C. and Maity, J., *Ground Improvement Techniques*, PHI Learning, 2017.
2. Han, J*., Principles and Practice of Ground Improvement*, John Wiley, 2015.
3. Siva Kumar Babu, G. L., *An Introduction to Soil Reinforcement & Geosynthetics*, Universities Press, 2005.

IS CODES:

IS 13094 – 1992	:	Selection of Ground Improvement Techniques for Foundations in Weak Soils.
IS 15284 (Part 2)- 2004	:	Design and Construction for Ground Improvement.

III B.Tech. – II Semester

(20BT60108) **URBAN STORMWATER MANAGEMENT**

(Professional Elective–1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	-	3

PRE-REQUISITES: Course on Engineering Hydrology, Fluid Mechanics.

COURSE DESCRIPTION: Concept of Urban hydrology, Rainfall analysis for urban stormwater design, Rainfall abstraction, Urban stormwater analysis and management and Overview of urban stormwater models.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze urban hydrological cycle for estimating stormwater runoff considering latest developments, society, environment, and sustainability besides communicating effectively in graphical form.

CO2. Analyze rainfall data for solving complex urban drainage problems using different techniques considering latest developments,relevant guidelines, society, environment and sustainabilitybesides communicating effectively in graphical form.

CO3. Analyze abstractions losses from urban catchments for solving for solving complex urban hydrology problems using different tools and techniques considering latest developments, relevant guidelines, environment and sustainabilitybesides communicating effectively in graphical form.

CO4. Design synthetic hydrographs for solving complex urban stormwater drainage problems using different tools and techniques considering latest developments,relevant guidelines, safety, environment, sustainabilityand management besides communicating effectively in graphical form.

CO5. Design urban drainage networks for solving complex urban stormwater drainage problems using different tools and techniques considering latest developments,relevant guidelines, safety, environment and sustainabilitybesides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3	-	-	-	1	1	-	-	1	-	2	-	-	3
CO2	4	2	3	-	2	2	1	1	2	-	1	-	2	-	-	3
CO3	4	2	3	-	2	2	1	1	2	-	1	-	2	-	-	3
CO4	6	1	2	3	2	2	1	1	2	-	1	3	2	-	-	3
CO5	6	1	2	3	2	2	1	1	2	-	1	-	2	-	-	3
Average		1.60	2.60	3.00	2.00	2.00	1.00	1.00	2.00	-	1.00	3.00	2.00	-	-	3.00
Course Correlation Level		2	3	3	2	2	1	1	2	-	1	3	2	-	-	3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT - I: URBAN HYDROLOGY (09 Periods)

Urban hydrological cycle, Urban water resources – Major problems, Historical perspective; Effects of urbanization on catchment hydrology, Interaction of land use and urban stormwater runoff, Need for urban drainage system.

UNIT - II: RAINFALL ANALYSIS FOR URBAN STORMWATER DESIGN(09 Periods)

Rainfall data, Depth-duration-rainfall analysis, Areal effect of point rainfall, Design rainfall duration, Time distribution of design rainfall, examples of design rainfall development.

UNIT - III: RAINFALL ABSTRACTION (10 Periods)

Introduction, Interception, Detention and retention concepts, Depression storage, Infiltration, SCS method, The Φ-Index, Importance of losses in urbanized basins, Open channel flows in urban watersheds.

UNIT - IV: URBAN STORMWATER ANALYSIS AND MANAGEMENT (09 Periods)

Rational method, SCS composite hydrograph method, time of concentration, Synthetic unit hydrograph method, urban runoff processes, Hydraulic analysis and design guidelines, Flow and storage capacity of urban components, Temple tanks, Social awareness and involvement.

UNIT - V: OVERVIEW OF URBAN STORMWATER MODELS (08 Periods)

Introduction, Structural and nonstructural control measures, Types of models, Role of urban stormwater models and levels of analysis, Storm water management model (SWMM), Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Hall, M.J., *Urban Hydrology*, Elsevier Applied Science Publishers, 1st Edition, 1984.
2. David, F. K.,*Urban Stormwater Hydrology (Water Resources Monograph)*, American Geophysical Union, 4th Edition, 1991.

REFERENCE BOOKS:

1. David, B., Christopher, J. D., Christos, M. and John, W. D, *Urban Drainage*, CRC Press, 4th Edition, 2018.
2. Osman, A. A. and Houghtalen, R. J., *Urban Hydrology, Hydraulics, and Stormwater Quality: Engineering Applications and Computer Modeling*, Wiley Publications, 1st Edition, 2003.
3. Overtens, D.E. and Meadows, M.E., *Storm Water Modelling*, Academic Press, New York, 1st Edition, 1976.
4. Wanielista, M.P. and Yousef, Y.A., *Stormwater Management*, John Wiley and Songs,Inc., New York, 1993.

ADDITIONAL LEARNING RESOURCES:

1. Oke, T. R., *Urban Climates*, Cambridge University Press.
2. Vieux,B. E., *Distributed Hydrologic Modeling Using GIS*, Springer Nature.
3. Singh,V. P.,*Computer Models of Watershed Hydrology*, Water Resources Publications.

III B. Tech. – II Semester
(20BT60109)**RAILWAY ENGINEERING**
(Professional Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course onTransportation Engineering.

COURSE DESCRIPTION: Railways in India and alignment of railway lines; Permanent way; Geometric design of railway tracks; Points and Crossings; Rolling stock; Railway stations and yards; Signalling and interlocking; Maintenance of railway track.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze Indian railways and alignment of railway lines considering society and environment besides communicating effectively in graphical form.
CO2. Analyze various components of permanent way to solve railway engineering problems using appropriate tools and techniques following relevant guidelines considering society and environment besides communicating effectively in graphical form.
CO3. Designthe geometric features of a railway track and tongue rail to solve complex railway engineering problems using appropriate techniques and following relevant guidelines considering society, environment and sustainability besides communicating effectively in graphical form.
CO4. Analyze various components of points and crossings in a railway track to solve railway engineering problems using appropriate tools and techniques following relevant standardsconsidering safety besides communicating effectively in graphical form.
CO5. Analyze rolling stock, layouts of railway stations and yards following relevant guidelinesconsidering safety besides communicating effectively in graphical form.
CO6. Analyze signaling, interlocking and maintenance of railway trackto solve railway engineering problems using appropriate tools and techniques following relevant specifications considering safety besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3				1	1			1				3	
CO2	4	2	3		1	1	1	1	1		2				3	
CO3	6	3	3	3	1	1	1	1	1		1				3	
CO4	4	2	3		1	2	1		1		2				3	
CO5	4	2	3				1		1		1				3	
CO6	4	2	3		1	1	2		1		1				3	
Average		2.16	3.00	3.00	1.00	1.25	1.16	1.00	1.00		1.33				3.00	
Course CorrelationLevel		3	3	3	1	2	2	1	1		2				3	

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: RAILWAYS IN INDIA AND ALIGNMENT OF RAILWAY LINES (9 Periods)

Railways in India: Role of Indian Railways in national development, Classification of railway lines in India.

Alignment of Railway Lines: Importance of good alignment, Basic requirements of an ideal alignment, Selection of a good alignment.

UNIT-II: PERMANENT WAY AND GEOMETRIC DESIGN (11 Periods)

Permanent Way: Components and their functions, Rails – Functions and types, Rail fastenings; Concept of gauges, Coning of wheels, Creep; Sleepers – Functions and requirements, Sleeper density and spacingtypes, Methods of fixing rails with pre-stressed concrete and wooden sleepers; Ballast – functions, types, sizes.

Geometric Design of Railway Tracks:Necessity for geometric design, Gradients, Grade compensation on curves; Curves – Circular, Transition, Compound and reverse; Superelevation.

UNIT-III: POINTS AND CROSSINGS (8 Periods)

Switches – Types, Switch angle, Flangeway clearance, Heel divergence, Throw of the switch; Tongue rails – design; Crossings – types; Turnouts – types.

UNIT-IV: ROLLING STOCK, RAILWAY STATIONS AND YARDS (8 Periods)

Re-laying of track, Layouts of railway stations and yards, Rolling stock, Tractive power, Track resistance, Level crossings.

UNIT-V: SIGNALING, INTERLOCKING AND MAINTENANCE OF RAILWAY TRACK (9 Periods)

Signalling and Interlocking:Signalling, Interlocking and track circuiting - Construction and maintenance.

Maintenance of Railway Track: Maintenance program - Monsoon, pre monsoon, post monsoon maintenance; Causes for maintenance, Tools for railway track maintenance and their functions, Surface defects and their remedial measures.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Chandra, S. and Agarwal, M. M., *Railway Engineering*, Oxford University Press, New Delhi, India, 2nd Edition, 2013.
2. Saxena, S. C. and Arora, S. P., *A Text book of Railway Engineering*, Dhanpat Rai Publications,2010.

REFERENCE BOOKS:

1. JotinKhisty, C. and Kent Lall, B.,*Transportation Engineering – An Introduction,*Prentice Hall of India Pvt. Ltd., 3rd Edition, 2016.
2. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd., 2005.
3. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning*, PearsonIN, 3rd Edition, 2015.
4. Mannering, F. L. andWashburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley& Sons, Inc., 5th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Rangwala, S. C., *Railway Engineering*, Charotar Publishing House Pvt. Ltd., 27thEdition, 2017.
2. *Indian Railways Code for Engineering Department*, 4th Edition, 2012.
3. *A hand book for DO's and DON'Ts on Points & Crossings* by Government of India, Ministry of Railways.

III B. Tech. – II Semester

(20BT60110) ADVANCED REINFORCED CEMENT CONCRETE STRUCTURES

(Professional Elective – 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	--	--	3

PRE-REQUISITES: Courses onCivil Engineering Materials and Concrete Technology, Engineering Mechanics, Mechanics of Solids, Structural Analysis, Reinforced Cement Concrete Structures.

COURSE DESCRIPTION: Advanced reinforced cement concrete structures: Foundations; Flat slabs; Retaining walls; Water tanks; Bunkers; Silos; Chimneys.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design foundations to solve complex problems related to reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.

CO2. Design flat slabs to solve complex problems related to reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.

CO3. Design retaining walls to solve complex problems related to reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.

CO4. Design water tanks to solve complex problems related to reinforced cement concrete structures usingappropriate methods and relevant codes of practice ensuring safety and serviceabilitybesides communicating effectively through schematic detailing.

CO5. Design bunkers, silos and chimneys to solve complex problems related to reinforced cement concrete structures using appropriate methods and relevant codes of practice ensuring safety and serviceability besides communicating effectively through schematic detailing.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	1	2	3	3	2	2		2		1			3		
CO2	6	1	2	3	3	2	2		2		1			3		
CO3	6	1	2	3	3	2	2		2		1			3		
CO4	6	1	2	3	3	2	2		2		1			3		
CO5	6	1	2	3	3	2	2		2		1			3		
Average		1	2	3	3	2	2		2		1			3		
Correlation Levels		1	2	3	3	2	2		2		1			3		

Correlation Levels: 3: H – High 2: M – Medium 1: L – Low

DETAILED SYLLABUS:

UNIT - I: FOUNDATIONS (10 Periods)

Design of Strap Footings; Raft Foundations; Pile Foundations; Pile Cap.

UNIT - II: FLAT SLABS (08 Periods)

Properties of flat slabs, Behaviour of flat slab, Shear in flat slabs, Design of flat slabs.

UNIT - III: RETAINING WALLS (09 Periods)

Lateral earth pressure, Design of cantilever and counterfort retaining walls.

UNIT - IV: WATER TANKS (09 Periods)

Types of water tanks, IS code provisions, Design of water tanks with flexible base and rigid base.

UNIT -V: MISCELLANEOUS STRUCTURES (09 Periods)

Design of Bunkers, Silos, Chimneys.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Syal, I.C., Goel, A.K., *Reinforced Concrete Structures*, S. Chand & Company Ltd., 4th Edition, 2010.
2. Krishna Raju, *Advanced Reinforced Concrete Design*, CBS Publishers and Distributors, 3rd Edition 2016.

REFERENCE BOOKS:

1. Roy,S. K. and Sinha,N. C., *Fundamentals of Reinforced Concrete*, S. Chand & Company Ltd., 5th Edition, 2013.
2. Varghese,P. C.,*Limit State Design of Reinforced Concrete*, Prentice Hall of India, 2nd Edition, 2010.
3. Punmia,B. C., Ashok Kumar Jain and Arun Kumar Jain, *Reinforced Concrete Structures – Vol. I*, Laxmi Publications Pvt. Ltd., 7th Edition, 2013.
4. Gambhir,M. L.,*Fundamentals of Reinforced Concrete Design,* Printice Hall of India Pvt. Ltd., 2011.

ADDITIONAL LEARNING RESOURCES:

1. Park and Paulay, *Reinforced Concrete Structures*, Willey Publishers, 1975.
2. Arthus H. Nilson, David Darwin, and Chorles W. Dolar,*Design of Concrete Structures*, Tata Mc. Graw-Hill, 13thEdition, 2005.
3. Karve,S.R., Shah,V.L.,*Limit State Theory and Design of Reinforced Concrete*, Standard Publishers, Pune, 3rd Edition, 1994.
4. Krishna Raju,N. and Pranesh,R. N.,*Reinforced Concrete Design*, CBS Publishers Distributors, 1stEdition, 2018.
5. Unnikrishna Pillai, S., Devdas Menon, *Reinforced Concrete Design*, Tata Mc. Graw Hill, 3rd Edition, 2010.
6. Sargis S. Safarian, Ernest C Harris*, Design and Construction of Silos and Bunkers*, Van Nostrand Reinhold, 1985

Codes:

IS 456 - 200 :Plain and Reinforced Concrete – Code of Practice
SP 16 - 1980 :Design Aids for Reinforced Concrete to IS 456
IS 1904 - 1988 :Design and Construction of Foundations in Soils:
IS 2950- 1981 : Design and Construction of Foundations
IS 3370-2009 :Concrete Structures for Storage of Liquids
IS: 4995- 1974 :Design of Reinforced Concrete Bins for the Storage of Granular and Powdery Materials
IS: 875– 1987 :Design loads for Buildings and Structures
IS 1649-1962 :Design and Construction of Flues and Chimneys for Domestic Heating Appliances
IS 4998-1992 :Design of Reinforced Concrete Chimneys

III B.Tech. – II Semester

(20BT60111)**GEOENVIRONMENTAL ENGINEERING**

(Professional Elective -2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: CoursesonSoilMechanics andEnvironmentalEngineering.

COURSE DESCRIPTION: Fundamentals of geoenvironmental engineering; Soil–water–contaminant interaction; Waste containment system; Contaminant site remediation; Advancedsoil characterization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze geoenvironmental properties of soil to solve complex problems of geoenvironmental engineering through continuous learning by ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze soil-water-contaminant interaction to solve complex geoenvironmental engineering problems using appropriate tools and techniques ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO3. Design waste containment systems to solve complex geoenvironmental engineering problems using appropriate tools and techniques by following the relevant codes of practice and ensuring cost effectiveness, safety, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze contaminated site characterization and remediation to solve complex geoenvironmental engineering problems using appropriate tools and techniques by following the relevant codes of practice and ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze advanced soil characterization techniques to solve complex problems of geoenvironmental engineering by following the relevant codes of practice and through continuous learning by ensuring safety, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3	-	1	1	3	3	-	-	1	-	1	-	3	-
CO2	4	2	3	-	2	1	3	3	-	-	1	-	-	-	3	-
CO3	6	1	2	3	2	2	3	3	1	-	1	-	-	-	3	-
CO4	4	2	3	-	2	2	3	3	2	-	1	1	-	-	3	-
CO5	4	2	3	-	2	2	3	3	1	-	1	-	1	-	3	-
Average		1.80	2.80	3.00	1.80	1.60	3.00	3.00	1.33	-	1.00	1.00	1.00	-	3.00	-
Course Correlation Level		2	3	3	2	2	3	3	2	-	1	1	1	-	3	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT - I: FUNDAMENTALS OF GEOENVIROMENTAL ENGINEERING

(09 Periods)

Scope of geoenvironmental engineering, Multiphase behaviorofsoil,Roleofsoilingeoenvironmentalapplications;Importanceofsoilphysics,soilchemistry,hydrogeology andbiologicalprocess;Sources and type of ground contamination, Impact of groundcontaminationongeoenvironmental,Casehistoriesongeoenvironmentalproblems.

UNIT - II: SOIL- WATER – CONTAMINANT INTERACTION (09 Periods)

Soilmineralogycharacterizationanditssignificanceindeterminingsoilbehavior,Soil–waterinteractionandconceptsof double layer, Forces of interaction between soil particles,Conceptsofunsaturatedsoil,Importanceofunsaturatedsoil in geoenvironmental problems, Measurement of soil suction,Waterretentioncurves,Waterflowinsaturatedandunsaturatedzone,Soil–water–contaminantinteractionsanditsimplications,Factors affectingretentionandtransportofcontaminants.

UNIT - III: WASTE CONTAINMENT SYSTEM (09 Periods)

Evolutionofwastecontainmentfacilitiesanddisposalpractices,Siteselectionbasedonenvironmentalimpactassessment,Differentrolesofsoilinwastecontainment,Differentcomponentsofwastecontainmentsystemanditsstability issues,Propertyevaluationforcheckingsoilsuitabilityforwastecontainment,Designofwastecontainmentfacilities.

UNIT - IV: CONTAMINANTSITEREMEDIATION (09 Periods)

Site characterization, Risk assessment of contaminated site, Soil remediation technologies– Soil vapour extraction, Soil washing, Stabilization/solidification, Electro-kinetic remediation, Thermal desorption, Vitrification, Bioremediation Phytoremediation; Groundwater remediation technologies – Pump and treat, In–situ flushing, Permeable reactive barriers, In–situ air sparging, Monitored natural attenuation, Bioremediation; Selection and planning of remediation technologies, Some examples of in–situ remediation.

UNIT - V: ADVANCEDSOILCHARACTERIZATION(09 Periods)

Contaminant analysis, Water content and permeability measurements, Electrical and thermal property evaluation, Use of GPR for site evaluation, Introduction to geotechnical centrifuge modeling, Characterization of contaminated soils by using latest techniques.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Reddi, L. N. and Inyang, H. I., *Geoenvironmental Engineering Principles and Applications*, Marcel Dekker Inc, 1st Edition, 2000.
2. Sharma, H. D. and Reddy, K. R., *Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies*, John Wiley & Sons, Inc., USA,1st Edition, 2004.

REFERENCE BOOKS:

1. Rowe, R. K., *Geotechnical and Geoenvironmental Engineering Handbook*, Kluwer Academic,1st Edition, 2001.
2. Yong, R. N., *Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation*, CRC Press, New York,1st Edition, 2001.
3. Bedient,P.B., Refai, H. S. and Newell, C. J., *Ground Water Contamination: Transport and Remediation,* Prentice Hall Publications, 2nd Edition, 1999.

4. LaGrega, M. D., Buckingham, P. L. and Evans, J. C., *Hazardous Waste Management*, New Delhi,MedTech, 2nd Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Wise,D.L., Trantolo,D.J., Inyang, H.I. and Cichon, E.J., Remediation *Engineering of Contaminated Soils*, Marcel Dekker Inc,1st Edition, 2000.
2. Fredlund, D.G. and Rahardjo, H.,*Soil Mechanics for Unsaturated Soils*, Wiley-Interscience, USA,1st Edition, 1993.
3. Hillel, D.,*Introduction to Environmental Soil Physics*, Academic Press, New York,1st Edition, 2003.
4. Sparks, D.L.,*Environmental Soil Chemistry*, Academic Press, New York,2nd Edition, 2002.

III B. Tech. – II Semester
(20BT60112) **GLOBAL POSITIONING SYSTEM**

(Professional Elective – 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Physics.

COURSE DESCRIPTION: Geodesy;Overview of Global Positioning System (GPS);GPS signal structure;GPSErrors and accuracy;GPS surveying and applications.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyzegeodesy to solve complex problems of global positioning system using appropriate techniques considering societyand ethics besides communicating effectively in graphical form.

CO2. Analyze GPS to solve complex navigation problems using appropriate tools and techniques considering societyand ethics besides communicating effectively in graphical form.

CO3. Analyze GPS signal structure to solve complex GPS problems using appropriate tools and techniques considering society and ethics besides communicating effectively in graphical form.

CO4. Analyze GPS errors and accuracy to solve complex GPS problems using appropriate tools and techniques considering society and ethics besides communicating effectively in graphical form.

CO5. Analyze GPS Surveying and applications to solve complex surveying problems using appropriate tools and techniques following latest developments considering society, environment, sustainability and ethics besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		1	2	1		1		2					3
CO2	4	2	3		1	2	1		1		2					3
CO3	4	2	3		1	2	1		1		2					3
CO4	4	2	3		1	2	1		1		2					3
CO5	4	2	3		1	2	1	1	1		2		1			3
Average		2	3		1	2	1	1	1		2		1			3
Course Correlation Level		2	3		1	2	1	1	1		2		1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: GEODESY (09 Periods)

Fundamentals of geodesy, Earth geoid and ellipsoid, Reference surface, geodetic systems, Indian geodetic system, Coordinate systems and transformations.

UNIT – II:OVERVIEW OF GLOBAL POSITIONING SYSTEM (08 Periods)

NAVSTAR GPS, GLONASS, Indian regional navigational Satellite system, Segments of GPS,Blocks of GPS- Block I, II/IIA;Advantages and current limitations of GPS.

UNIT – III:GPS SIGNAL STRUCTURE (09 Periods)

Carriers, GPS codes - C/A, P, Navigational message; GPS receiver - Types and structure of receivers; Principles of GPS position fixing, Pseudo ranging.

UNIT – IV:GPS ERRORS AND ACCURACY (09 Periods)

Satellite dependent - Ephemeris errors, Satellite clock bias, Selective availability; Receiver dependent - Receiver clock bias, Cycle slip, Selective availability; Observation medium dependent: Ionospheric errors, Tropospheric errors; Station dependent - Multipath, Station coordinates; Satellite geometry based measures - Geometry dependent (Dilution of Precision: DOP),User equivalent range error.

UNIT – V:GPS SURVEYING AND APPLICATIONS (10 Periods)

Static surveying and kinematics surveying, DGPS survey, Preparation of GPS surveys - Setting up an observation plan, Observation strategies, Network design; GPS applications - Cadastral surveys, Remote sensing and GIS, Military applications and vehicle tracking, Infrastructure development, Natural disasters, Latest advancements in GPS applications.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Sateesh Gopi, *Global Positioning Systems – Principles and Applications*, McGraw Hill Education (India) Pvt. Ltd., 2014.
2. Akash Deep Sharma, *Global Positioning System*, MD Publication Pvt. Ltd., New Delhi (India), 2008.

REFERENCE BOOKS:

1. Gunter Seeber, *Satellite Geodesy,* Walter De Gruyter, Berlin (Germany), 2nd Edition, 2003.
2. Pratap Misra and Per Enge, *Global Positioning System,* Ganga Jamuna Press, 2006.
3. Bradford, W. Parkinson and James J. Spiker Jr., *Global Positioning System: Theory and Applications*, *Vol I and II*, American Institute of Aeronautics and Astronautics: Washington (USA), 1996.
4. Hofmann Wellenhof, B., Lichtenegger, H. and Collins, J., *Global Positioning System: Theory and Practice*, Springer, Berlin (Germany), 1994.

ADDITIONAL LEARNING RESOURCES:

1. Mohinder S. Grewal, Lawrence R. Weill and Angus P. Andrews, *Global Positioning Systems, Inertial Navigation and Integration,* John Wiley & Sons, 2nd Edition, 2007.
2. Terry-Karen Steede, *Integrating GIS and the Global Positioning System*, ESRI Press,

III B. Tech. – II Semester

(20BT60113)**GROUNDWATER DEVELOPMENT AND MANAGEMENT**

(Professional Elective – 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses onEngineering Hydrology, Irrigation Engineering and Hydraulic Structures.

COURSE DESCRIPTION: Groundwater occurrence and movement; Analysis of pumping test data; Saline water intrusion in an aquifer; Artificial recharge of groundwater; Groundwater exploration.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze groundwater occurrence and movement to solve groundwater problems using appropriate techniques following relevant standards considering society, environment and sustainabilitybesides communicating effectively in graphical form.

CO2. Analyze pumping test data for solving complex ground water problems using appropriate methods considering codes of practice,health and safety, environment and sustainabilitybesides communicating effectively in graphical form.

CO3. Analyze saline water intrusion in an aquifer for solving complex ground water problems using appropriate techniques considering codes of practice, health, society, environment and sustainabilitybesides communicating effectively in graphical form.

CO4. Analyze artificial groundwater recharge sites to solve groundwater problems using appropriate tools and techniques considering society, environment and sustainabilitybesides communicating effectively in graphical form.

CO5. Analyze exploration to solve complex groundwater problems using appropriate tools and techniques following relevant codes of practice and latest developments considering health, safety, society, environment, sustainability and economics besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3			2	1	1	1		1					3
CO2	4	2	3		2	2	1	1	1		1					3
CO3	4	2	3			2	1	1	1		1					3
CO4	4	2	3			2	1	1	1		1					3
CO5	4	2	3			2	1	1	1		1		1			3
Average		2.00	3.00		2.00	2.00	1.00	1.00	1.00		1.00		1.00			3.00
Course Correlation Level		2	3		2	2	1	1	1		1		1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT I– GROUNDWATER OCCURRENCE AND MOVEMENT (09 periods)
Groundwater hydrologic cycle – Origin of groundwater; Vertical distribution of groundwater, Geological formations as aquifers, Types of aquifers, Aquifer parameters; Darcy's law, Groundwater flow equation; Groundwater flow contours and their applications.

UNIT II – ANALYSIS OF PUMPING TEST DATA (10 periods)
Steady groundwater flow towards a well in confined and unconfined aquifers, Unsteady radial flow towards a well, Non equilibrium equations – Thies solution, Jacob and Chow's solutions; Yield of an open well.

UNIT III – SALINE WATER INTRUSION IN AN AQUIFER (08 periods)
Saline water intrusion, Ghyben–Herzberg relation, Shape of interface, Effects and control of sea water intrusion, Recognition of sea water in groundwater, Case studies.

UNIT IV – ARTIFICAL RECHARGE OF GROUNDWATER (09 periods)
Artificial recharge - Recharge methods, Merits, Application of GIS and Remote Sensing in artificial recharge of groundwater along with case studies; Conjunctive use.

UNIT V – GROUNDWATER EXPLORATION (10 periods)
Groundwater exploration, Surface methods - Electrical resistivity and seismic refraction methods; Subsurface methods – Geophysical logging and resistivity logging; Field survey using electrical resistivity method, Latest developments.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:
1. Raghunath, H. M., *Groundwater*, Wiley Eastern Ltd., 3rd Edition, 2007.
2. Todd, D. K., *Groundwater Hydrology*, Wiley India Pvt. Ltd., 3rd Edition, 2011.

REFERENCE BOOKS:
1. Karanth,K. R., *Groundwater Assessment*, *Development and Management*, Mc. Graw Hill Education,1stEdition, 2017.
2. Chahar, B. R., *Groundwater Hydrology*, Mc. Graw Hill India, 2017.
3. Franklin, W. Schwartz, *Fundamentals of Ground Water*, Wiley Publication,1st Edition, 2003.
4. Freeze, A.R.and Cherry, J.A.,*Groundwater*, Prentice-Hall Publication,2003.

ADDITIONAL LEARNING RESOURCES:
1. Ramakrishnan,S., *Groundwater*, SciTech Publications (India) Pvt. Ltd, 2nd Edition, 2014.
2. Subramanyam, K., *Engineering Hydrology*, McGraw Hill Publications, 5th Edition, 2017.

III B. Tech. – II Semester

(20BT60114)**REHABILITATION AND RETROFITTING OF STRUCTURES**

(Professional Elective –2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Civil Engineering Materials and Concrete Technology; Construction, Planning and Project Management; Reinforced Cement Concrete Structures.

COURSE DESCRIPTION: Maintenance and repair strategies; Serviceability and durability of concrete; Materials and techniques for repair; Repairs, Rehabilitation and Retrofitting of structures; Demolition techniques.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze maintenance and repair strategies to solve rehabilitation and retrofitting problems of structures using various tools and techniques following relevant codes and standards considering safety, serviceability, environment and sustainability.

CO2. Analyze the serviceability and durability of concrete to solve complex rehabilitation and retrofitting problems of structures using various tools and techniques following relevant codes and standardsconsidering safety, serviceability, environment and sustainabilitybesides communicating effectively in graphical form.

CO3. Analyze materials for repair to solve complex rehabilitation and retrofitting problems of structuresusing tools and techniques to following relevant codes and standards considering safety, serviceability, environment and sustainability.

CO4. Analyze various techniques for repair to solve complex rehabilitation and retrofitting problems of structures to following relevant codes, standards and latest development considering safety, serviceability, environment and sustainability.

CO5. Analyze various rehabilitation, retrofitting and demolition procedures for repair to solve complex rehabilitation and retrofitting problems of structures to following relevant codes, standards and latest developments considering safety, serviceability, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	4	2	3			3	1	1	1					3		
CO2	4	2	3		3	3	1	1	1		1			3		
CO3	4	2	3		3	3	1	1	1					3		
CO4	4	2	3		3	3	2	1	1				1	3		
CO5	4	2	3		3	3	2	1	1		1		1	3		
Average		2	3		3	3	1.4	1	1		1		1	3		

Correlation Levels	2	3		3	3	2	1	1		1		1	3		

Correlation Levels: 3 - High 2 - Medium 1 – Low

DETAILED SYLLABUS:

UNIT - I: MAINTENANCE AND REPAIR STRATEGIES (08 periods)
Maintenance, Repair and rehabilitation, Facets of maintenance, Importance ofmaintenance, various aspects of inspection, Assessment procedure for evaluating a damaged structure, Causes of deterioration.

UNIT - II: SERVICEABILITY AND DURABILITY OF CONCRETE (09 periods)
Quality assurance for concrete construction, Concrete properties– Strength, Permeability, Thermal properties; Cracks– Causes and effects due to climate, temperature, chemicals, and corrosion; Design and construction errors – Effects of cover thickness and cracking

UNIT-III: MATERIALS FOR REPAIR (10 periods)
Special concretes and mortar, Concrete chemicals, Special elements for acceleratedstrength gain, Expansive cement, Polymer concrete, Sulphur infiltrated concrete, Ferrocement, Fiber reinforced concrete, Rust eliminators and polymers coating for rebarsduring repair, Foamed concrete, Mortar and dry pack, Vacuum concrete.

UNIT- IV:TECHNIQUES FOR REPAIR (09 periods)
Load test for stability,Gunite and shotcrete, Epoxy injection, Mortar repair for cracks, Shoring and underpinning, Methods of corrosion protection, Corrosion inhibitors, Corrosion resistant steels, Coating to reinforcement and cathodic protection; Repairs to overcome low member strength, deflection, chemical disruption, weathering, corrosion, wear, fire, leakage and marine exposure; Latest developments.

UNIT- V: REHABILITATION, RETROFITTING AND DEMOLITION OF STRUCTURES (9 periods)

Rehabilitation, Retrofitting of Structures:Introduction to beam-shear capacity strengthening, Flexural strengthening, Column strengthening, Failure mode of masonry building, Retrofitting strategies for RC members global level and local level retrofitting;Retrofitting of historical buildings, strengthening and case studies; Latest developments.

***Demolition of Structures*:** Engineered demolition techniques for dilapidated structures – Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Vidivelli, B.,*Rehabilitation of Concrete Structures*, Standard PublishersDistributors, 2008.
2. Bhattacharjee. J., *Concrete Structures Repair, Rehabilitation and Retrofitting*, CBS Publishers and Distributors (P). Ltd., New Delhi, 2019.

REFERENCE BOOKS:

1. Shetty, M. S., *Concrete Technology*, S. Chand and Company Ltd., New Delhi, 2003.
2. Zongjinli, *Advanced Concrete Technology*, John Wiley and Sons, 2011.
3. Alexander, M. G., Beushausen,H. D., Dehn, F. and Moyo,P., *Concrete Repair, Rehabilitation and Retrofitting III*, CRC Press, Balkama, 2012.
4. Guha, P. K.,*Maintenance and Repairs of Buildings*, New Central Book Agency (P)Ltd., 2006.

ADDITIONAL REFFERENCE RESOURCES:

1. Varghese. P. C., *Maintenance Repair & Rehabilitation & Minor Works of Buildings,* PHI Learning Private Limited, Delhi, 2014.
2. Alakesh Manna, *Reliability and Maintenance Engineering*, I.K. International Publishing House Pvt. Ltd., 2011.
3. Pankaj Agarwal and Manish Shrikhande*, Earthquake Resistant Design of Structures,* Prentice Hall of India, 2006.
4. *Hand book on Seismic Retrofit of Buildings,* Indian Building Congress (IBC) and Indian Institute of Technology, Madars, Narosa Publishing House, 2008.

CODES

IS 13935 – 2009 : Repair and Seismic Strengthening of Building

III B.Tech. - II Semester

(20BT60115) **SOLID AND HAZARDOUS WASTE MANAGEMENT**

(Professional Elective–2)

Int. Marks	Ext. Marks	Total	L	T	P	C
30	70	100	3	-	–	3

PREREQUISITES: Course on Environmental Science.

COURSE DESCRIPTION: Sources and types of municipal solid wastes; Onsite handling; Storage and processing; Collection and transfer; Off-site processing and disposal, Hazardous waste management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze municipal solid waste to solve complex problems associated with it using appropriate tools and techniques, following relevant codes, regulations and latest developments considering health, society, environment, sustainability and economics besides communicating effectively in graphical form.

CO2. Analyze on–site storage and processing of municipal solid waste to solve complex problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment and sustainability and economics besides communicating effectively in graphical form.

CO3. Analyze collection and transfer of municipal solid waste to solve complex problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment, sustainability and economics besides communicating effectively in graphical form.

CO4. Analyze off–site processing of municipal solid waste to solve complex problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment, sustainability, economics and project management besides communicating effectively in graphical form.

CO5. Design sanitary landfills to solve complex municipal solid waste disposal problems using appropriate tools and techniques following relevant guidelines and latest developments considering health, society, environment, sustainability, economics and project management besides communicating effectively in graphical form.

CO6. Analyze hazardous waste to solve complex problems associated with it using appropriate tools and techniques following relevant codes, regulations and latest developments considering health, society, environment, sustainability and project management besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		1	1	3	3	2		1	1	1			3
CO2	4	2	3		1	2	3	3	2		1	1	1			3
CO3	4	2	3		1	2	3	3	2		1	1	1			3
CO4	4	2	3		1	2	3	3	2		1	1	1			3
CO5	6	1	2	3	1	2	3	3	2		1	1	1			3

CO6	4	2	3		1	2	3	3	2		1	1	1			3
Average		1.83	2.83	3.00	1.00	1.83	3.00	3.00	2.00		1.00	1.00	1.00			3.00
Course Correlation Level		2	3	3	1	2	3	3	2		1	1	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: MUNICIPAL SOLID WASTE (09 Periods)
Sources and types of solid wastes – Quantity, Factors affecting generation of solid wastes, Characteristics, Methods of sampling and characterization, , Public health effects, Social and economic aspects, Public awareness, Role of NGOs, Legislation.

UNIT – II: ON–SITE STORAGE AND PROCESSING (09 Periods)
Principles of solid waste management, On–site segregation and storage methods, Materials used for containers, Public health and economic aspects of storage, Options under Indian conditions, Critical evaluation of options.

UNIT – III: COLLECTION AND TRANSFER (09 Periods)
Methods of collection, Types of vehicles, Manpower requirement, Analysis of Collection routes, Transfer stations, Selection of location, Operation and maintenance, Collection options under Indian conditions.

UNIT – IV: OFF–SITE PROCESSINGAND DISPOSAL (08 Periods)
Off–Site Processing: Processing techniques and equipment, Resource and energy recovery from solid wastes – Composting, Incineration and pyrolysis.
***Disposal*:** Dumping of solid waste, Effects of improper disposal of solid wastes, Sanitary landfills – Site selection, Design and operation of sanitary landfills, Leachate collection and treatment.

UNIT – V: HAZARDOUS WASTE MANAGEMENT (10 Periods)
Introduction to Hazardous wastes, Definition of Hazardous waste, The magnitude of the problem, Risk assessment, Environmental legislation, Characterization and site assessment, Waste minimization and resource recovery, Transportation and disposal of hazardous waste; Biomedical waste management – Incineration and pyrolysis.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. George Tchobanoglouset, *Integrated Solid Waste Management*, McGraw–Hill Publishers, 2nd Edition, 2002.
2. Woodside, G., *Hazardous Materials and Hazardous Waste Management*, John Wiley & Sons, 2nd Edition, 1999.

REFERENCE BOOKS:

1. Ramachandra, T. V., *Management of Municipal Solid Waste*, The Energy and Resources Institute (TERI), 1st Edition, 2011.
2. *Manual on Municipal Solid Waste Management*, CPHEEO, Ministry of Urban Development, Government of India, 2000.
3. Asnani, P. U., and Chris Zurbrugg, *Improving Municipal Solid Waste Management in India: A Sourcebook for Policymakers and Practitioners*, World Bank Publications,1st Edition, 2007.
4. Bhide, A. D. and Sundaresan, B. B., *Solid Waste Management in Developing Countries*, INSDOC, 1st Edition, 2010.

ADDITIONAL LEARNING RESOURCES:

1. Burke, Gwendolyn, Ben Ramnarine Singh, and Louis Theodore, *Handbook of Environmental Management and Technology*, John Wiley & Sons, 2nd Edition, 2000.

III B. Tech. – II Semester

(20BT60116) TRANSPORTATION PLANNING AND MANAGEMENT

(Professional Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course onTransportation Engineering.

COURSE DESCRIPTION: Transportation planning process; Transportation surveys; Trip generation; Trip distribution; Mode choice; Trip assignment; Transport economics; Land use transportation models; Mass transit systems.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyzetransportation planning process and surveys to solve transportation problems using appropriate techniques considering society and environment.

CO2. Analyzetrip generation and trip distribution to solve complex transportation problems using appropriate techniques considering safety besides communicating effectively in graphical form.

CO3. Analyzemode choice and trip assignment to solve complex transportation problems using appropriate techniques following relevant guidelines considering safety besides communicating effectively in graphical form.

CO4. Analyzetransportation economics and land use transport models to solve transportation planning and management problems using appropriate techniquesconsidering society besides communicating effectively in graphical form.

CO5. Analyzemass transit systems to solve complex transportation problems using appropriate techniques following relevant codes and latest developments considering society and environment besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		1	1	1	1							3	
CO2	4	2	3		2	1	1				1				3	
CO3	4	2	3		2	1	1		1		1				3	
CO4	4	2	3		1	1	1				1	1			3	
CO5	4	2	3		2	1	1	1	1		1		1		3	
Average		2.00	3.00		1.60	1.00	1.00	1.00	1.00		1.00	1.00	1.00		3.00	
Course CorrelationLevel		2	3		2	1	1	1	1		1	1	1		3	

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: TRANSPORTATION PLANNING PROCESS AND SURVEYS (9 Periods)

Transportation Planning Process*:* System approach to transportation planning; Stages in transportation planning and difficulties in transportation planning process.

Transportation Surveys: Study area zoning, Types of surveys –Home interview survey, Commercial vehicle survey,Intermediate public transportsurvey, Cordon line survey, Post cardquestionnaire survey,Registrationnumber survey,Tag-on-vehicle survey.

UNIT-II: TRIP GENERATION AND TRIP DISTRIBUTION (9 Periods)

Trip Generation*:* Factors governing trip generation and attraction, Multiple linear regression analysis.

Trip Distribution:Presentation of trip distribution data, Uniform and average factor methodof trip distribution, Fratarmethodof trip distribution, Furness methodof trip distribution, Gravity model of trip distribution.

UNIT-III: MODE CHOICE AND TRIP ASSIGNMENT (9 Periods)

Mode Choice: Influencing factors, Trip-end type modal split model, Trip-interchange modal split model, Disaggregate mode-choice model, Logit model of mode-Choice.

Trip Assignment: Description of transport network, Route choice behaviour, The minimum path, Minimum path algorithm, Route assignment techniques, All-or-nothing assignment, Multipath traffic assignment, Capacity-restrained traffic assignment.

UNIT-IV: TRANSPORTATION ECONOMICS AND LAND USE TRANSPORT MODELS (9 Periods)

Transportation Economics: Economic evaluation of highway schemes - Necessity, Cost and benefits of transportation projects; Basic principlesof economic evaluation - Net present value method, Benefit/Cost ratiomethod, Internal rate of return method; Vehicle operating costs, Valueof travel time saving, Accident costs.

Land Use Transport Models: Selection of land, Lowry model, Grain-Lowrymodel, Applications of Lowry model.

UNIT-V: MASS TRANSIT SYSTEMS (9 Periods)

Urban passenger transport modes and classifications; System Performance -Capacity and quality of service; Planning issues - Route determination, Network design, Service policy and schedule development; Scheduling - Trip generation, Blocking, Runcutting and rostering, Priority measures and their implementations, Improvements in mass transportation system - Issues and challenges.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 9th Edition, 1999.
2. Jotin Khisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction*, Prentice Hall of India Pvt. Ltd., 3rd Edition, 2006.

REFERENCES

1. Hutchinson, B. G., *Principles of Urban Transport Systems Planning*, McGraw-Hill Book Co., New York, 1974.
2. Vuchic Vukan, R., *Urban Transit: Operations, Planning and Economics*, Prentice Hall, 2005.
3. Gray, G. E. and Hoel, L. A., *Public Transportation*, Prentice Hall, 2nd Edition, 1992.

4. Ortuzar, J. D. and Willumsen, L. G., *Modelling Transport*, Wiley, 4th Edition, 2011.

ADDITIONAL LEARNING RESOURCES:

1. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering*,Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.
2. Ashish Verma and Ramanayya, T. V., *Public Transport Planning and Management* in Developing Countries, CRC Press, 2020.

III B.Tech. II Semester

(20BT60314) **OPTIMIZATION TECHNIQUES**

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES:A course on Differential equations and Multi variable calculus.

COURSE DESCRIPTION: Introduction to optimization; classical optimization techniques; classification of optimization problems; linear programming; Transshipment and Travelling salesman problem; non-linear programming;un-constrained non-linear programming; constrained non-linear programming; dynamic programming; Genetic Algorithm; Ant Colony Optimization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Model and solve unconstrained optimization problems.
CO2. Apply LP TechniquesandConduct Sensitivity analysis for real lifeProblems
CO3. Apply Non-Linear Programmingtechniques for real life problems.
CO4. Analyze various complex problems by using Dynamic programming approaches.
CO5. Model and solve complex problems using evolutionary algorithmsto optimize the paramenters.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1		1									
CO2	3	3	3	1		1									
CO3	3	3	3	1		1									
CO4	3	3	3	1		1									
CO5	3	3	3	1		1									
Average	3	3	3	1		1									
Correlation level	3	3	3	1		1									

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT -I: CLASSICAL OPTIMIZATION TECHNIQUES (09 periods)

Introduction, Engineering applications of optimization, Statement of an optimization problem, Design vector, Design constraints, Constraint surface, Objective function,Classification of optimization problems,Single variable optimization,Multi variable optimization without constraints,Multi variable optimization with equality constraints - Lagrange multipliers method;Multi variable optimization with inequality constraint - Kuhn Tucker conditions.

UNIT -II: LINEAR PROGRAMMING (09 periods)

Introduction, Formulation, Primal Simplex method, Dual simplex method, Sensitivity Analysis, Goal programming

UNIT –III: NON-LINEAR PROGRAMMING (09 periods)

One dimensional minimization methods, classification - Fibonacci method, quadratic interpolation method; classification of unconstrained minimization methods - Powell's method, steepest descent method (Cauchy's method); classification of constrained optimization techniques - interior and exterior penalty function methods.

UNIT –IV: DYNAMIC PROGRAMMING (09 periods)

Multistage decision processes,Concept of sub optimization and Principle of optimality,Computational procedure in dynamic programming - Calculus method,Tabular method; Linear Programming problem by dynamic programming approach, Applications - reliability problem, shortest path problem, and capital budgeting problem.

UNIT- V: EVOLUTIONARY OPTIMIZATION ALGORITHMS (09 periods)

Introduction to Evolutionary optimization, genetic algorithm-Mathematical Modeling of Genetic algorithm, Ant Colony Optimization, particle swarmOptimization and differential evolution techniques.

Total Periods:45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Singiresu S Rao, *Engineering Optimization: Theory and Practice*, New Age International, 3rdEdition, 2013.
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, *Engineering Optimization: Methods and applications*, Wiley India Pvt. Ltd., 2nd Edition, 2006.
3. Dan Simon, Evolutionary Optimization Algorithms, John Wiley & Sons, 2013.

REFERENCE BOOKS:

1. C Mohan and Kusum Deep, *Optimization Techniques*, New Age International Publishers, 1st Edition, 2010.
2. Hamdy A. Taha, *Introduction to Operations Research*, PHI, 10thEdition, 2017.

III B. Tech. – II Semester

(20BT60344) **Thermodynamics and Heat Transfer**

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Applied Physics and Fluid Mechanics

COURSE DESCRIPTION: Thermodynamic system; Energy interactions; Heat and work Transfer in flow and non- flow systems; Laws of thermodynamics; Reversible and irreversible processes, Modes of heat transfer; One dimensional steady and transient conduction; Convection heat transfer; free convection; Heat exchangers; radiation; Concept of black body; irradiative heat exchange between surfaces.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the knowledge of thermodynamic systems, properties, and zeroth law of thermodynamics

CO2. Analyze thermodynamic systems using First law of Thermodynamics and determine the thermodynamic properties during energy interactions in engineering application.

CO3. Analyze thermodynamic systems using second law of Thermodynamics and determine the performance parameters of heat engine and heat pump.

CO4. Calculate heat transfer rates and heat transfer coefficients in conduction, convection and radiation heat transfer processes.

CO5. Analyze heat exchangers, boiler and condensers and determine heat transfer rates.

Mapping of COs with POs and PSOs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1													
CO2	3	3	1	1											
CO3	3	3	1	1											
CO4	3	3	1	1											
CO5	3	3	1	1											
Average	3	2.6	1	1											
Correlation level	3	3	1	1											

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT - I: BASIC CONCEPTS OF THERMODYNAMICS (9 Periods)

Microscopic and macroscopic point of view, Thermodynamic systems, Control volume, Thermodynamic properties, Processes, Cycle, Homogeneous and Heterogeneous systems,

Thermodynamic equilibrium, Quasi – static process, Concept of continuum, Work transfer and Heat transfer, Point and path function, Zeroth law of thermodynamics**.**

UNIT - II: FIRST LAW OF THERMODYNAMICS (9 Periods)

First Law of Thermodynamics: First law for a closed system undergoing a cycle, First law for a closed system undergoing a change of state, Limitations of first Law, Perpetual motion machine of first kind (PMM1), Energy a property of system, First law applied to a flow process - steady flow energy equation (SFEE).

UNIT - III: SECOND LAW OF THERMODYNAMICS (9 Periods)

Second Law of Thermodynamics: Energy reservoir, Kelvin plank and Clausius statements of second law and their equivalence, PMM of second kind (PMM2), Heat engine, Refrigerator, Heat pump, Reversibility and Irreversibility, Carnot cycle.

UNIT - IV: MODES OF HEAT TRANSFER (9 Periods)

Basics of Heat Transfer, Modes and Mechanism of heat transfer, Conduction, convection and radiation, General differential equation of heat conduction - Cartesian, Cylindrical and Spherical Coordinates.

UNIT – V: BOILERS, CONDENSERS AND HEAT EXCHANGERS (9 periods)

Boiling: Pool Boiling Regimes, Determination of Heat Transfer Coefficient in Nucleate Boiling.

Condensation:Film wise and Drop wise Condensation.

***Heat Exchangers*:** Classification of Heat Exchangers, Overall Heat Transfer Coefficient and Fouling Factor, Concepts of LMTD and NTU Methods.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. P. K. Nag, *Engineering Thermodynamics*, TMH, 5th Edition, 2013.
2. R.C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, New Age International, 5th Edition, 2017.

REFERENCE BOOKS:

1. R.K.Rajput, *Thermal Engineering*, Laxmi Publications (P) Ltd, 10th Edition, 2017.
2. R.K.Rajput, Heat and Mass Transfer, S.Chand & Company Ltd, 7th Edition, 2018.

III B. Tech. – I Semester

(20BT60117) **FIRE ENGINEERING**

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Engineering Chemistry, Civil Engineering Materials and Concrete Technology, Environmental Studies.

COURSE DESCRIPTION: Physics and chemistry of fire; Fire prevention and protection; Industrial fire protection systems; Building fire safety; Explosion protecting systems.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze fire characteristics to solve fire engineering problems by using appropriate tools and techniques considering health, safety and environment.
CO2. Analyze the principles of fire prevention, detection and warning to solve fire engineering problems using appropriate tools and techniques considering health, safety and environmentbesides communicating effectively in graphical form.
CO3. Analyze industrial fire protection systems to solve complex fire engineering problemsby using appropriatetools and techniques considering health, safety, environment, relevant codes of practice and manage effectively.
CO4. Design building fire safety to solve complex fire engineering problems by using appropriate techniques considering health, safety, environment, relevant codes of practice and manage effectively.
CO5. Analyze explosion protecting systems to solve complex fire engineering problems by using appropriate tools and techniques considering health, safety, environment, sustainability, relevant codes of practice and manage effectively.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3			2	1	1						3		
CO2	4	3	3			2	1	1			1			3		
CO3	4	3	3		2	2	1	1	1			1		3		
CO4	6	3	2	3	2	2	1	1	1			1		3		
CO5	4	3	3			2	1	1	1			1		3		
Average		3	2.8	3	2	2	1	1	1		1	1		3		
Course Correlation Level		3	3	3	2	2	1	1	1		1	1	1	3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: PHYSICS AND CHEMISTRY OF FIRE (09 Periods)

Fire properties of solid, liquid and gases; Fire spread, Toxicity of products of combustion, Theory of combustion and explosion, Vapour clouds, Flash fire, Jet fires, Pool fires, Unconfined vapour cloud explosion, Shock waves, Auto-ignition, Boiling liquid expanding vapour explosion, Case studies

UNIT – II: PRINCIPLES OF FIRE PREVENTION, DETECTION AND WARNING (09 Periods)

Sources of ignition, Fire triangle, Principles of fire extinguishing, Various classes of fires – A, B, C, D & E, Types of fire extinguishers, Fire stoppers, FireAlarm and detection systems, Fire station - Fire alarms and sirens, Maintenance of fire trucks, Firefighting foams,Escape from fire rescue operations, Fire drills, Notice, First aid for burns

UNIT – III: INDUSTRIAL FIRE PROTECTION SYSTEMS (09 Periods)

Active and passive fire protection systems, Sprinkler-hydrants-stand pipes, Special fire suppression systems like deluge and emulsifier, Selection criteria of the above installations, Reliability, Maintenance, Evaluation and standards, Hydrant pipes, Hoses, monitors, Fire watchers, Layout of stand pipes, Other suppression systems, CO2 system, Foam system, Dry chemical powder (DCP) system, Halon system, Need for halon replacement, Smoke venting, Portable extinguishers, Flammable liquids, Tank farms, Indices of inflammability.

UNIT - IV: BUILDING FIRE SAFETY (09 periods)

Design of building elements for passive fire protection, Fire load, Fire resistant material and fire testing, Structural fire protection, Structural integrity, Classification of buildings based on occupancy, Concept of egress design, Exit requirements, Width calculations, fire certificates, Fire safety requirements for high rise buildings.

UNIT – V: EXPLOSION PROTECTING SYSTEMS (09 Periods)

Principles of explosion, Detonation and blast waves, Explosion parameters, Explosion Protection, Containment, Flame Arrestors, Isolation, Venting,Suppression, Explosion relief of large enclosure, Explosion venting, Inert gases, Plant for generation of inert gas,Rupture disc in process vessels and lines explosion, Suppression system based on carbon dioxide (CO2) and halons-hazards in LPG, ammonia (NH_3), sulphur dioxide (SO_2), chlorine (CL_2) etc.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Jain,V. K.,*Fire Safety in Buildings,* New Age international Publishers, 3rd Edition, 2010.
2. Akhil Kumar Das, *Principles of Fire Safety Engineering*, Prentice Hall India Learning Pvt. Ltd., 2014.

REFERENCE BOOKS:

1. Gupta, R. S*., Hand Book of Fire Technology*, Orient Longman, Bombay 2017.
2. Sunil S. Rao, Jain, R. K. and H. I. Saluja, *Electrical Safety, Fire Safety Engineering and Mangament*, Kanna Publications, New Delhi, 2012.
3. John A. Purkiss and Long-yuan Li, *Fire Safety Engineering Design of Structures*, CRC Press, 3rd Edition, 2013.
4. Butcher, E. G. and Parnell, A. C., *Designing of Fire Safety*, David Fulton Publishers, 1983.

ADDITIONAL LEARNING RESOURCES:

1. Derek W. B. James, *Fire Prevention Hand Book*, Butter Worths and Company, 1986.
2. Jane Lataille,*Fire Protection Engineering in Building Design,* Butterworth-Heinemann; 1st Edition, 2002.

III B. Tech. – II Semester

(20BT60118) INTELLIGENT TRANSPORTATION SYSTEMS

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course onTransportation Engineering.

COURSE DESCRIPTION: Intelligent Transportation Systems (ITS**)**; Telecommunications in ITS;ITS Functional areas; ITS User needs and services; Automated highway systems.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze intelligent transport systemsto solve complex transportation problems using appropriate techniques following relevant guidelines and latest developments considering society and environment besides communicating effectively in graphical form.

CO2. Analyze telecommunications in ITSto solve complex transportation problems using appropriate techniques considering society and environment besides communicating effectively in graphical form.

CO3. Analyze ITS functional areas to solve complex transportation problems using appropriate techniques following relevant guidelines and latest developments considering society and environment.

CO4. Analyze ITS user needs and servicesto solve complex transportation problems using appropriate techniques following relevant guidelines and latest developments considering safety and environment.

CO5. Analyze automated highway systems to solvetransportation problems following relevant guidelines and latest developments considering society and environment.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		1	2	1	1	1		1		1		3	
CO2	4	2	3		1	1	1	1			1				3	
CO3	4	2	3		2	1	1	1	1				1		3	
CO4	4	3	3		1	1	1	1	1				1		3	
CO5	4	3	3				1	1	1				1		3	
Average		2.60	3.00		1.25	1.25	1.00	1.00	1.00		1.00		1.00		3.00	
Course CorrelationLevel		3	3		2	2	1	1	1		1		1		3	

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: INTELLIGENT TRANSPORTATION SYSTEMS (ITS) (9 Periods)

Intelligent Transportation Systems (ITS) – Definition of ITS and identification of ITS objectives, Historical background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), Video data collection.

UNIT-II: TELECOMMUNICATIONS IN ITS (9 Periods)

Importance of telecommunicationsin the ITS system, Information management, Traffic Management Centres (TMC); Vehicle – Road side communication, Vehicle positioning system.

UNIT-III: ITS FUNCTIONAL AREAS (9 Periods)

Advanced Traffic Management Systems (ATMS), Advanced Traveller Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

UNIT-IV: ITS USER NEEDS AND SERVICES (9 Periods)

Travel and traffic management, Public transportation management, Electronic payment, commercial vehicle operations, Emergency management, Advanced vehicle safety systems, Information management.

UNIT-V: AUTOMATED HIGHWAY SYSTEMS (9 Periods)

Vehicles in platoons – Integration of automated highway systems; ITS Programs in the world – Overview of ITS implementations in developed countries, ITS in developing countries.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Pradip Kumar Sarkar and Amit Kumar Jain, *Intelligent Transport Systems*, PHI Learning, 2018.
2. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.

REFERENCE BOOKS:

1. Jotin Khisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction*, Prentice Hall of India Pvt. Ltd., 2006.
2. Chakroborthy, P. and Das, A., *Principles of Transportation Engineering*, Prentice Hall of India Pvt. Ltd, New Delhi, 2nd Edition, 2017.
3. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning*, PearsonIN, 3rd Edition, 2015.
4. Mannering, Fred L., Walter P. Kilareski., Scott S. Washburn, *Principles ofHighway Engineering and Traffic Analysis*, John Wiley&Sons, 3rd Edition, 2004.

ADDITIONAL LEARNING RESOURCES:

1. *National ITS Architecture Documentation*, US Department of Transportation, 2007.
2. Kan Paul Chen and John Miles, *ITS Hand Book 2000: Recommendations for World Road Association (PIARC)*.

III B.Tech. – II Semester

(20BT60119)**SMART MATERIALS AND STRUCTURES**

(Interdisciplinary Elective-2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Civil Engineering Materials and Concrete Technology;Structural Analysis; Reinforced Cement Concrete Structures; Steel Structures

COURSE DESCRIPTION: Smart materials and structures; Measuring techniques and types; Sensing systems; Actuators; Data acquisition and processing.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze smart materials and various components of smart structuresto solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structuresbesides lifelong learning.

CO2. Analyze various strain measuring toolsto solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.

CO3. Analyze various sensing systemsto solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.

CO4. Analyze various materials and techniques used in actuators to solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.

CO5. Analyze the signals from the smart structures and monitor the structural deficiencies prior to failure to solve problems associated with smart structures for ensuring safety and sustainability using appropriate tools and techniques in structures besides lifelong learning.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		3	3	2	2					1	3		
CO2	4	2	3		3	3	2	2					1	3		
CO3	4	2	3		3	3	2	2					1	3		
CO4	4	2	3		3	3	2	2					1	3		
CO5	4	2	3		3	3	2	2					1	3		
CO6	4	2	3		3	3	2	2					1	3		
Average		2	3		3	3	2	2					1	3		
Course Correlation Level		2	3		3	3	2	2					1	3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I:SMART MATERIALS AND STRUCTURES (08 Periods)

Smart materials and structures, Instrumented structures functions and response Sensing systems, Self-diagnosis, Signal processing consideration, Actuation systems and effectors

UNIT – II: MEASURING TECHNIQUES AND TYPES (08 Periods)

Strain measuring techniques using electrical strain gauges- Types, Resistance, Capacitance, Inductance, Wheatstone bridges, Pressure transducers, Load cells, Temperature compensation, Strain rosettes.

UNIT–III: SENSING SYSTEMS (11 Periods)

Sensing technology, Types of sensors, Physical measurement using piezo electric strain measurement, Inductively read transducers, LVDT, Fiber optic techniques, Chemical and Bio-chemical sensing in structural assessment, Absorptive chemical sensors, Spectroscopes, Fibre optic chemical sensing systems and distributed measurement.

UNIT – IV: ACTUATORS (09 Periods)

Actuator techniques, Actuator and actuator materials, Piezoelectric and electrostrictive material, Magneto structure material, Shape memory alloys, Electro rheological fluids, Electromagnetic actuation, Role of actuators and Actuator materials.

UNIT – V: DATA ACQUISITION AND PROCESSING (09 Periods)

Data acquisition and processing, Signal processing and control for smart structures, Sensors as geometrical processors, Signal processing, Control system- Linear and non-linear.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Brain Culshaw, *Smart Structure and Materials*, Artech House – Borton. London, 2004.
2. Srinivasan,A. V.and Michael McFarland,D., *Smart Structures: Analysis and Design*,Cambridge University Press, 2009.

REFERENCE BOOKS:

1. Gandhi,M.V. and Thompson,B.S., *Smart Materials and Structures*, Chapman and Hall, NewYork, 1992.
2. Mel. M Schwartz, *Encyclopedia of Smart Materials*, John Wiley and Sons Inc., 2002.
3. Srinath, L. S., Raghavan, M.R., Lingaiah, K., Gargesa. G., Pant. B., Ramachandra, K., *Experimental Stress Analysis*, Tata McGraw-Hill, 1984.
4. Dally,J. W. and Riley,W. F., *Experimental Stress Analysis*, Tata McGraw-Hill, 3rd Edition, 1991.

ADDITIONAL LEARNING RESOURCES:

1. Michelle Addington and Daniel L. Schodek, *Smart Materials and Technologies: For the Architecture and Design Professions*, Routledge, 2005.
2. Gauenzi, P., *Smart Structures: Physical Behaviour, Mathematical Modelling and Applications*, Wiley, 2009.
3. Cady, W. G., *Piezoelectricity Volume One*, Dover Publication, 2018.

III B. Tech. – II Semester

(20BT60131) CIVIL ENGINEERING SOFTWARE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Courses in different domains of Civil Engineering.

COURSE DESCRIPTION: Software tools in modeling, analysis and design of systems in different domains of Civil Engineering: Structural Engineering; Geotechnical Engineering; Transportation Engineering; Environmental Engineering; Water Resources Engineering; Construction Engineering; Surveying.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design structures, structural components and pavements to solve complex structural engineering and pavement engineering problems using appropriate software tools and techniques following relevant codes considering safety, serviceability, environment,sustainability and cost effectiveness.

CO2. Analyze geotechnical, water resources and environmental engineering systems to solve complex engineering problems using appropriate software tools and techniques following relevant codes considering safety, serviceability, environment,sustainability and cost effectiveness.

CO3. Prepare project management schedules, estimation and costing reports to solve complex construction engineering problems using appropriate software tools and techniques following relevant codes and standards considering safety, serviceability, environment, sustainability.

CO4. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on computer aided structural design and detailing.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	1	2	3	2	3	1	1	2					3		
CO2	4	2	3		2	3	1	1	1					3		
CO3	6	1	2	3	2	3	1	1	1					3		
CO4	4									3	3			3		
Average		1.3	2.3	3	2	3	1	1	1.3	3	3			3		
Course Correlation Level		2	3	3	2	3	1	1	2	3	3			3		

Correlation Levels: H: High M: Medium L: Low

DETAILED SYLLABUS:

This laboratory provides training to the students in using popular softwares for various Civil Engineering Applications as mentioned below.

LIST OF EXERCISES:

1. **ROBOT Structure** forStructural Analysis and Design
2. **SAP 2000** for Structural Analysis and Design
3. **ETABS**for Integrated Analysis, Design and Drafting of Building Systems
4. **NISA–CIVIL** for Structural Analysis And Design
5. **PLAXIS 2D/3D** for Geotechnical Modeling Software
6. **GEOSLOPE** for Slope Stability Analysis
7. **FLAC 2D/3D** forGeotechnical Modeling Software
8. **Civil 3D** for Computer Aided Civil Engineering Drafting
9. **MXROAD SUITE** forPavement Design,Rehabilitation and Renewal
10. **KENPAVE**for Pavement Design and Rate Analysis of Roads
11. **SYNCHRO** forTraffic Signal Timing and Analysis Software
12. **MIKE-SHE** for Hydrologic and Hydraulic Modeling
13. **HEC-HMS** for Hydrologic Modeling System
14. **SWMM** for Storm Water Management Model
15. **SWAT** for Soil and Water Assessment Tool
16. **EPANET**for Hydraulic and Water Quality Behavior of Water Distribution System
17. **OPEN FOAM** for Fluid Flow Simulation and Analysis
18. **Visual MODFLOW** for Water Resources Engineering
19. **PRIMAVERA** forProject Management
20. **MS PROJECT** for Project Management
21. **Auto Plotter** for Analysis of Surveying Results
22. **Auto CAD Revit Structure Suite** for Analysis and Design of Various Structural Members
23. **Auto CAD Revit Architecture** for Plotting the Graphical Design of Structural Members
24. **Spread Sheets**for Civil Engineering Applications

Note: A minimum of twelve exercises are to be performed covering all technical areas of civil engineering

TEXT BOOKS:

1. ShahV. L. and KarveS.R., *Illustrated Design of Reinforced Concrete Building*, Structures Publication, Pune, 7th Edition, 2014.
2. Krishnamurthy. D., *Structural Design and Drawing, Vol-II and Vol-III*, CBS Publishers and Distributors, Delhi, 2006.

REFERENCE BOOKS:

1. *Civil Engineering Software Lab* (SVEC19 Regulations), Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.
2. Manuals supplied by the Software Providers.

CODES:

IS 456 – 2000: Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.
IS 800 – 2007: General Construction in Steel, Bureau of Indian Standards, New Delhi.
SP-16 – 1980: Design Aids for Reinforced Concrete, Bureau of Indian Standards, New Delhi.
SP-34 – 1987: Hand Book on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.

III B.Tech. – II Semester

(20BT60132) **CONCRETE TECHNOLOGY LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Course on Civil Engineering Materials and Concrete Technology.

COURSE DESCRIPTION: Experimentson Cement, Fine aggregates, Fresh and hardened concrete; Elasticity; NDT; Mix design- IS method.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Evaluate properties of constituent materials of concrete (Cement, Fine Aggregate, Coarse Aggregate) using varioustools and techniques to solve complex problems related to concrete technology by following relevant IS codes and latest developments ensuring cost effectiveness, safety, environment and sustainability.

CO2. Evaluate properties fresh and hardened concrete using various tools and techniques to solve complex problems related to concrete technology by following relevant IS codes and latest developments ensuring cost effectiveness, safety, environment and sustainability.

CO3. Design the concrete mix to solve complex problems related to concrete technology using appropriate methods by following relevant IS codes and latest developments ensuring cost effectiveness, safety, environment and sustainability.

CO4. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on concrete technology.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	2	3		3	3	1	2	2			1	1	3		
CO2	5	2	3		3	3	1	2	2			2	2	3		
CO3	6	2	2	3	3	1	1	2	2			2	2	3		
CO4	4									3	3			3		
Average		2.00	2.66	3	3	2.33	1	2	2	3	3	1.66	1.66	3		
Course Correlation Level		2	3	3	3	3	1	2	2	3	3	2	2	3		

Correlation Levels: 3 - High 2 – Medium 1 – Low

LIST OF EXPERIMENTS/EXERCISES:

A. TESTS ON CEMENT

1. Fineness of cement by dry sieving
2. Fineness of cement by Blaine's air permeability method
3. Standard consistency of cement
4. Initial and Final setting time of cement
5. Soundness of cement
6. Specific gravity of cement
7. Compressive strength test on cement

B. TESTS ON FINE AGGREGATE

8. Sieve analysis of fine aggregate
9. Specific gravity of fine aggregate
10. Bulking of fine aggregate

E. CONCRETE MIX DESIGN – IS Method

F. TESTS ON FRESHCONCRETE

11. Slump cone test on fresh concrete
12. Compaction factor test on fresh concrete
13. Vee-Bee consistometer test on fresh concrete

G. TESTS ON HARDENED CONCRETE

14. Compressive strength test on concrete
15. Split tensile strength test on concrete
16. Flexural strength test on concrete
17. Modulus of elasticity on concrete
18. Rapid chloride permeability test for durability of concrete
19. Carbonation resistance test for durability of concrete

H. NON-DESTRUCTIVE TESTS ON HARDENED CONCRETE

20. Rebound hammer test
21. PUNDIT

REFERENCE BOOKS:

1. Duggal, S. K., *Building Materials*, New Age International Publishers, 4th Edition, 2012.
2. Neville,A. M.,*Properties of Concrete*, John Wiley and Sons, New Delhi, 5th Edition, 2011.

LABORATORY MANUALS:

1. *Concrete Technology Manual (SVEC20 Regulations),* Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

IS Codes:

IS 10262 – 2000	: Concrete Mix design
IS 1708 (Part-3)	: Method of Testing of Small Clear Specimen of Timber
IS 4031 – 1988	: Chemical Analysis and Tests on Cement
IS 383 – 1970	: Coarse and Fine Aggregates
IS 10264 – 2009	: Mix Design of Concrete
IS 1199 – 1959	: Methods of Sampling and Analysis of Concrete
IS 13311 – 1992	: Methods of Non-destructive Testing of Concrete

III B. Tech. – II Semester

(20BT51551)**INTERNET OF THINGS LAB**

(Common to CE, EIE, CSE, CSE(AI) and CSE(DS))

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	1	2	2

PRE-REQUISITES:-

COURSE DESCRIPTION:

Setting up IoT work-flow, Programming with Python, Micro-controller programming using Arduino, Building IoT Applications using Raspberry Pi, IoT Cloud Infrastructure.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design an interface to embedded systems using real time sensors with Arduino and Raspberry Pi.
CO2. Develop applications to capture the data generated by sensors and send to cloud.
CO3. Develop real time applications using NodeMCU and BLYNK.
CO4. Design applications to push sensor data to cloud using MQTT protocol.
CO5. Work independently and in team to solve problems with effective communication.

Mapping of COs with POs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	2	3	-	-	1	2	2	2	-	-	-	-			
CO3	1	1	-	-	2	2	2	3	-	-	-	-			
CO4	1	1	-	-	1	3	1	1	-	-	-	-			
CO5	1	1	-	-	2	1	3	2	-	-	-	-			
Average	1.6	1.5	--	--	1.5	2	2	2	--	--	--	--			
Correlation level	2	2	--	--	2	2	2	2	--	--	--	--			

Correlation Levels: 3 - High 2 – Medium 1 – LowDETAILED

Theory Component: **(10 Periods)**

Arduino IDE, 7-segment display, Servo motor, ultrasonic sensor, LCD, Flame sensor, gas sensor, Humidity & temperature sensors, MQTT protocols, ECG System, Raspberry Pi, Home security system with camera, PIR sensor, light sensor, motion detector, NodeMCU, BLYNK, cloud

LIST OF EXPERIMENTS:

1. (a) Design and Simulate LED 7-Segment Display interfacing with Arduino.
(b) Design and Simulate Servo motor interfacing with Arduino.
2. (a) Design and Simulate ultrasonic sensor and LCD interfacing with Arduino.
(b) Design and Simulate Flame Sensor interfacing with Arduino.
3. Design and Implement to capture Gas Sensor and send sensor data to cloud from your NodeMCU device using Arduino IDE.

4. Design and Implementation of Humidity and Temperature Monitoring Using Arduino and upload data to cloud using MQTT.
5. Design and Implementation of an IoT ECG (Electrocardiogram) System to record hearts electrical activity.
6. Design and Simulate controlling an LED 7-Segment Display with Raspberry Pi.
7. Design and implementation of Raspberry Pi Home Security System with Camera and PIR Sensor with Email Notifications.
8. Design and Implement to upload Light sensor (TSL) data to cloud through Raspberry Pi.
9. Design and Implementation of Motion Detector with NodeMCU and BLYNK.
10. Design and Implementation of Fire notification IoT system with BLYNK.

REFERENCE BOOKS:

1. Adrian McEwen and HakinCassimally, *Designing the Internet of Things,* Wiley India.
2. Simon Monk, *Programming Aurdino,* Second Edition,McGraw-Hill Education**,**2016.
3. Matt Richardson and Shawn Wallace, *Getting Started with Raspberry Pi*, O'Reilly, 2014.
4. Rahul Dubey, *An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications* , Cengage Learning India Pvt. Ltd,2019

III B. Tech. – II Semester

(20BT5MC01) **PROFESSIONAL ETHICS**

(Mandatory Course)

(CE, ME, ECE, EEE & EIE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	-	30	2	-	-	-

PRE-REQUISITES:-

COURSE DESCRIPTION: Engineering Ethics; Professional Ideals and Virtues; Engineering as Social Experimentation; Responsibilities and Rights; Global Issues.

COURSE OUTCOMES: After successful completion of the course,students will be able to:

CO1. Demonstrate knowledge of Engineering Ethics,Senses of engineering ethics, Moral dilemmas and theories in professional engineering practice

CO2. Analyze the concepts of Professional ideals to assess and to address societal, health, safety, legal and cultural issuesin discharging the professional responsibilities

CO3. Apply the reasoning informed by the various aspects of Code of Ethics and its provisionsto assess societal issues and carry out Professional responsibilities effectively

CO4. Practice Collegiality considering conflict of interests to safeguard professional rights in professional engineering practice.

CO5. Provide professional engineering solutions considering distinct ethics to address global issues.

Mapping of COs with POs

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-			
CO2	2	3	-	-	1	2	2	2	-	-	-	-			
CO3	1	1	-	-	2	2	2	3	-	-	-	-			
CO4	1	1	-	-	1	3	1	1	-	-	-	-			
CO5	1	1	-	-	2	1	3	2	-	-	-	-			
Average	1.6	1.5	--	--	1.5	2	2	2	--	--	--	--			
Correlation level	2	2	--	--	2	2	2	2	--	--	--	--			

Correlation Levels: 3 - High 2 – Medium 1 – LowDETAILED

DETAILED SYLLABUS:

UNIT-I:ENGINEERING ETHICS ` (05 periods)

Scope and aim of engineering ethics, Senses of engineering ethics, Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy-Kohlberg's theory,Gilligan's theory, Consensus and controversy.

UNIT-II:PROFESSIONAL IDEALS AND VIRTUES (06 periods)

Theories about virtues,Professions, Professionalism, Characteristics, Expectations, Professional responsibility, Integrity, Self-respect, Sense of responsibility, Self-interest, Customs and religion,Self-interest and ethical egoism, Customs and ethical relativism, Religion and divine command ethics, Use of ethical theories,Resolving moral dilemmas and moral leadership.

UNIT-III:ENGINEERING AS SOCIAL EXPERIMENTATION (07 periods)

Engineering as experimentation, Similarities to standard experiments, Learning from the past and knowledge gained, Engineers as responsible experimenters, Conscientiousness, Moral autonomy and accountability,The challenger case, Codes of ethics and limitations, Industrial standards, Problems with the law of engineering.

UNIT-IV: RIGHTS AND RESPONSIBILITIES OF AN ENGINEER (06 periods)

Collegiality and loyalty, Respect for authority, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Rights of engineers, Professional rights, Whistle-blowing, The BART case, Employee rights and discrimination.

UNIT-V: GLOBAL ISSUE (06 periods)

Multinational corporations, Professional ethics, Environmental ethics, Computer ethics, Engineers as consultants, Witnesses, Advisors and Leaders, Engineers as Managers, Managerial ethics applied to Engineering Profession, moral leadership.

Total Periods: 30

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw-Hill, 3rd edition, 2007.
2. Govindarajan, M., Nata Govindarajan, M., Natarajan, S. and Senthilkumar, V.S., *Engineering Ethics*, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. S. Kannan and K. Srilakshmi, *Human Values and Professional Ethics*, Taxmann Allied Services Pvt. Ltd., 2009
2. Edmund G. Seebauer and Robert L. Barry, *Fundamental of Ethics for Scientists and Engineers*, Oxford University Press, 2001

IV B.Tech. - I Semester

(20BT5HS02) PRINCIPLES OF BUSINESS ECONOMICS AND ACCOUNTANCY

(Common to CE and ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE REQUISITE: -

COURSE DESCRIPTION: Business economics and demand analysis; theory of production and cost analysis; markets and pricing; principles of accounting and capital; final accounts and tally erp 9.0

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate the principles of Business Economics and theories of Demand.
CO2. Apply the theories of Production and Cost for the managerial decision making of an organization.
CO3. Determine the Price and Output relation in the different Market structures.
CO4. Demonstrate the principles of Accountancy and sources of Capital.
CO5. Analyze the profitability and soundness of an organization.

Mapping of COs with POs

Course Outcomes	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	1	-
CO4	3	1	1	-	-	-	-	-	-	-	-	-
CO5	-	3	1	-	-	-	-	-	-	2	1	-
Average	2.25	2.4	-	-	-	-	-	-		2	1	-
Course correlation levels	2	3	-	-	-	-	-	-	-	2	1	-

Correlation Levels: 3 - High 2 – Medium 1 – Low

DETAILED SYLLABUS:

UNIT–I: BUSINESS ECONOMICS AND DEMAND ANALYSIS (9 periods)

Definition - Nature and Scope of Business Economics - Demand: Determinants of demand – Demand function - Law of demand, assumptions and exceptions - Elasticity of demand – Types of elasticity of demand - Demand forecasting and methods of demand forecasting.

UNIT–II: THEORY OF PRODUCTION AND COST ANALYSIS (9 periods)

Production Function:Input-output relationship - Law of Variable proportion- Isoquants and Isocosts

Cost Concepts:Total, Average and Marginal Cost **-** Fixed vs. Variable costs – Opportunity Costs Vs Outlay Costs– Separable Costs Vs Joint Costs, Urgent Costs VsPostponable Costs- Avoidable Costs Vs Unavoidable Costs

Break Even Analysis (BEA) – Assumptions, Merits and demerits - Determination of Break Even Point (Simple problems).

UNIT–III: MARKETS AND PRICING (9 periods)

Market Structure:Types of Markets - Features of perfect competition - Monopoly and monopolistic competition - Price and Output determination in perfect competition, monopoly and monopolistic Markets.

Pricing:Objectives and policies of pricing – Sealed bid pricing - Marginal cost pricing - Cost plus pricing - Going rate pricing – penetration Pricing –skimming Pricing - Block pricing – Peak load pricing - Cross subsidization.

UNIT–IV: PRINCIPLES OF ACCOUNTING & CAPITAL (9 periods)

Accountancy:Introduction – Concepts – Conventions – Double Entry Book Keeping – Journal – Ledger - Trial Balance (Simple problems)

Capital:Significance - Types of capital – Sources of Capital.

UNIT–V: FINAL ACCOUNTS & TALLY ERP 9.0 (9 periods)

Introduction to Final Accounts - Trading account - Profit and Loss account and Balance Sheet with simple adjustments (Simple problems)

Tally ERP 9.0:Introduction – Create a company – Create ledger – Posting vouchers – Advantages of Tally.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. H L Ahuja, *Business Economics (Thirteenth edition)*, S Chand Publishing, Jan 2016.
2. S.P. Jain and K.L. Narang, *Financial Accounting*, Kalyani Publishers, Ludhiana, 12th edition, 2018.

REFERENCE BOOKS:

1. Joseph G.Nellis and David Parker, Principles of Business Economics, Pearson Education Canada, 2nd edition, 2016.
2. Larry M. Walther, Financial Accounting, Create Space Independent Publishing Platform, July 2017.

IV B. Tech. – I Semester

(20BT70101) ESTIMATION AND QUANTITY SURVEYING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Civil Engineering Materials and Concrete Technology; Construction, Planning and Project Management; Surveying, Computer Aided Building Planning and Drawing.

COURSE DESCRIPTION: Estimation ofresidential buildings; Estimation of other structures; Specifications and rate analysis; Contracts and tenders; Valuation.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Estimate various components of residential buildings to solve complex problems of estimation using appropriate techniques by following relevant standards and codesbesides communicating effectively in graphical form.

CO2. Estimate other structures to solve complex problems of estimation using appropriate techniques by following relevant standards and codesbesides communicating effectively in graphical form.

CO3. Analyze specifications and rates for different items of building construction to solve complex problems of estimation using appropriate techniques by following relevant standards, codes and latest developmentsconsidering society.

CO4. Prepare contracts and tenders to solve the complex problems using appropriate techniques by following relevant standards and latest developments considering society, legal issues,environment, sustainability, project management and financial besides communicating effectively in graphical form.

CO5. Prepare valuation reports to solve the complex problems using appropriate techniques by following relevant standards and latest developments considering society, legal issues, project management and financial besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	5	2	3		3	2			1		1			3		
CO2	5	2	3		3	2			1		1			3		
CO3	4	2	3		3	1	1		1			3	2	3		
CO4	6	1	2	3	2	1	1	1	1		1	2	1	3		
CO5	6	1	2	3	2	1	1		1		1	2	1	3		
Average		1.6	2.6	3	2.6	1.4	1	1	1		1	2.33	1.33	3		
Course Correlation Level		2	3	3	3	2	1	1	1		1	3	2	3		

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT - I: ESTIMATION OF RESIDENTIAL BUILDINGS (10 Periods)
Types of estimation, Methods of estimation, Load bearing and framed structures – Calculation of quantities of earth work excavation,Brick work, RCC, PCC, Plastering, White washing, Color washing and painting/varnishing for shops, rooms;Residential building with flat and pitched roof, Various types of arches, Calculation of brick work and RCC works in arches; Estimate of joineries forpaneled and glazed doors, windows, ventilators etc.

UNIT - II: ESTIMATION OF OTHER STRCTURES (10 Periods)
Estimating different structures - Septic tank, Soak pit, Sanitary andwater supply installations, Water supply pipe line, Sewer line, Tube well,Open well, Roads, Retaining walls, Culverts.

UNIT - III: SPECIFICATIONS AND RATE ANALYSIS (09 Periods)
Purpose and method of writing specifications, General and detailed specification for different items of building construction, Lead statement, Data, Schedule of rates, Rate analysis -Concrete, Brick work, Plastering, Flooring and Painting.

UNIT - IV: CONTRACTS AND TENDERS (08 Periods)
Purpose of contract, Types of contract, Agreement, Tenders, Tender notice and form, Arbitration, Legal requirements.

UNIT - V: VALUATION (08 Periods)
Necessity, Basics of value engineering, Capitalized value, Depreciation, Escalation, Value of building, Calculation of standard rent, Mortgage, Lease.

Total Periods: 45

Topics for self-study are provided in lesion plan.

TEXT BOOKS:
1. Dutta. B.N., *Estimating and Costing in Civil Engineering*, UBS Publishers &Distributors Pvt. Ltd., 28th Edition, 2003.
2. Kohli, D.D. and Kohli, R.C., *A Text Book of Estimating and Costing (Civil)*, S. Chand & Company Ltd., 13th Edition, 2013.

REFERENCE BOOKS:
1 Chakraborthi, M.,*Estimating Costing Specification and Valuation in Civil Engineering*, Laxmi Publications, New Delhi, 23rd Edition, 2010.
2 Frank R. Dagastino and Steven J. Peterson, *Estimating in Building Construction*, 1989 Pearson Education, Inc., 7th Edition, 2011.
3 Rangawala, *Estimation, Costing and Valuation*, Charotar Publishing House Pvt. Ltd., 17th Edition, 2020.
4 Dieter Jacob and Clemens Muller, *Estimating in Heavy Constructions*, Wilhem Ernst and Sohn Publisher, Berlin, Germany, 2017

ADDITIONAL LEAINING RESOURCES:
1. *National Building Code of India*, BIS, Government of India, New Delhi, 2005.
2. *Standard Schedule of Rates and Standard Data Book*, Public Works Department.

CODES:
IS 1200(Parts I to XXV) – 1974 : *Method of Measurement of Building and Civil Engineering Works*.

IV B. Tech. – I semester

(20BT70102) EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Professional Elective – 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Engineering Geology, Structural Analysis, Reinforced Cement Concrete Structures

COURSE DESCRIPTION: Earthquake engineering; Earthquake analysis; Codal design and detailing provisions; Seismic planning; Shear walls and base isolation techniques.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze earthquakes to solve earthquake engineering problems using appropriate tools and techniques following relevant IS codes considering society and environment besides communicating effectively in graphical form.

CO2. Analyze earthquakes and seismic planning of buildingsto solve complex earthquake engineering problems using appropriate techniques besides communicating effectively in graphical form.

CO3. Design earthquake resistant structures to solve complex earthquake engineering problems using appropriate techniques and following IS codes considering safety, stability, environment and sustainability besides communicating effectively in graphical form.

CO4. Design earthquake resistant structures to solve complex earthquake engineering problems using capacity based method and following IS codes considering safety, stability, environment and sustainability besides communicating effectively in graphical form.

CO5. Design shear walls to solve complex earthquake engineering problems using appropriate techniques and following IS codes considering safety, stability, environment and sustainability besides communicating effectively in graphical form.

CO6. Analyze base isolation techniques to solve earthquake engineering problems following latest developments considering safety and environment besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	4	2	3			1	2	2	1		1			3		
CO2	4	2	3	3	3	2	1	1	2		2			3		
CO3	6	1	2	3	3	2	1	1	2		1			3		
CO4	6	1	2	3	3	2	1	1	2		1			3		
CO5	6	1	2	3	3	2	1	1	2		1			3		
CO6	4	1	3		3	1	2	1	2		1		2	3		
Average		1.33	2.50	3.00	3.00	1.66	1.33	1.16	1.83		1.16		2.00	3.00		
Course Correlation		2	3	3	3	2	2	2	2		2		2	3		

Level																

Correlation Levels: 3– High 2– Medium 1 - Low

DETAILED SYLLABUS:

UNIT – I:EARTHQUAKE ENGINEERING (08 Periods)

Engineering seismology, Earthquake phenomenon, Causes and effects of earthquakes, Faults, Structure of earth, Plate tectonics, Elastic rebound theory, Earthquake terminology - Source, Focus, Epicenter, Earthquake size, Magnitude and intensity of earthquakes; Classification of earthquakes, Seismic waves, Seismic zones, Seismic zoning map of India.

UNIT – II: SEISMIC ANALYSIS AND PLANNING (10 Periods)

Seismic Analysis - Rigid base excitation, Formulation of equations of motion for SDOF and MDOF Systems, Earthquake response analysis of single and multi-storied buildings, Use of response spectra.

Seismic Planning- Plan configurations, Torsion irregularities, Re-entrant corners, Non-parallel systems, Diaphragm discontinuity, Vertical discontinuities in load path, Irregularity in strength and stiffness, Mass irregularities, Vertical geometric irregularity, Proximity of adjacent buildings, Displacement requirements, drift requirements, Provisions for torsion.

UNIT–III:DESIGN OF EARTHQUAKE RESISTANT STRUCTURES (10 Periods)

Codal design& detailing provisions –Review of IS: 1893 – 2016 (Part–I), IS: 4326, IS: 13920 and SP – 34, Earthquake design philosophy – Assumptions, Design by seismic coefficient and response spectrum methods; Design of flexure members, Design of exterior columns, Design of interior columns, column subjected to bending and axial load, joint of frames, detailing of reinforcements, soft storey.

UNIT – IV: CAPACITY BASED DESIGN (09 Periods)

Preliminary data for plane frame, Determination of loads, Procedure for capacity-based design, Determination of moment magnification factors for column, Capacity design for shear in beams, Capacity design for shear in columns and detailing of reinforcement.

UNIT – V: SHEAR WALL AND BASE ISOLATION TECHNIQUES (08 Periods)

Shear Wall: Types, Design of shear walls as per IS: 13920 – Detailing of reinforcements.

Base Isolation Techniques:Seismic base isolation – Concept, Types; Variousdamper systems and their importance, Latest developments in earthquake resistant design.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. PankajAgarwal and Manish Shrikhande, *Earthquake Resistant Design of Structures,* Prentice Hall of India, 2006.
2. Duggal, S.K., *Earthquake Resistant Design of Structures*, Oxford University Press, 2010.

REFERENCE BOOKS:

1. Anil Chopra, K.,*Dynamics of Structures*, Pearson Education, 3rd Edition, 2007.
2. Clough and Penzien*, Dynamics of Structures*, McGraw–Hill, 3rd Edition, 2008.
3. Mario Paz, *Structural Dynamics - Theory and Computation*, Kluwer Academic Publication, 2004.
4. Murty, C.V.R., *Earthquake Tips*, NICEE (www.nicee.org), IIT, Kanpur.

CODES:

IS 1893 – 2016	: Criteria for Earthquake Resistant Design of Structures
IS 4326 – 1993	: Earthquake Resistant Design and Construction of Building
IS 13920 – 1993	: Ductile detailing of RC Structures subjected to Seismic forces
IS 456 – 2000	: Practice for Plain and Reinforcing Concrete
IS 875 – 1987	: Practice for Design Loads for Buildings and Structures
SP 34	: Indian Standard Handbook for Concrete Reinforcement and Detailing, Bureau of Indian Standards, 1987.

IV B. Tech. – I semester

(20BT70103) HIGHWAY CONSTRUCTION AND MAINTENANCE

(Professional Elective-3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Transportation Engineering

COURSE DESCRIPTION: Highway construction; Stabilized roads; Highway drainage, Hill roads; Highway construction equipment; Highway maintenance; Road side development.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze highway construction to solve complex highway engineering problems using appropriate tools and techniques following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze road stabilization techniques to solve complex highway engineering problems following relevant codes and latest developments considering society, environment and sustainability.

CO3. Design highway drainage and geometric features of hill roads to solve complex highway engineering problems using appropriate techniques and following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze various highway construction equipment to solve highway engineering problems using appropriate tools and techniques following latest developments ensuring safety and environment.

CO5. Analyze highway maintenance and road side development issues to solve complex highway engineering problems using appropriate tools and techniques following relevant codes considering society, environment and sustainability.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		1	1	1	1	1		1				3	
CO2	4	2	3		1	1	1	1	1				1		3	
CO3	6	1	2	3	2	1	1	1	1		1				3	
CO4	4	2	3		1	2	1	1	1				1		3	
CO5	4	2	3		1	2	1	1	1						3	
Average		1.80	2.80	3.00	1.20	1.40	1.00	1.00	1.00		1.00		1.00		3.00	
Course Correlation Level		2	3	3	2	2	1	1	1		1		1		3	

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: HIGHWAY CONSTRUCTION (9 Periods)

General construction, Earth work, Construction of fill and subgrade, Gravel roads, WBM roads, Bituminous pavements, Cement concrete pavements, Different types of joints in cement concrete pavements - Joint filler and sealer; Interlocking concrete block (ICBP) pavements.

UNIT-II: STABILIZED ROADS (9 Periods)

Introduction, Properties of soil-aggregate mixes, Mechanical soil stabilization, Soil-cement stabilization, Soil-lime stabilization, Stabilization of soil using bituminous materials and special problems in soil stabilization work, Latest developments in soil stabilization for road works.

UNIT-III: HIGHWAY DRAINAGE AND HILL ROADS (9 Periods)

Highway Drainage: Importance of highway drainage – Requirements; Surface drainage - Design of surface drainage system; Subsurface drainage, Drainage of slopes and erosion control, Road construction in water logged areas and black cotton soils.

Hill Roads: General considerations, Alignment of hill roads, Geometric design of hill roads, Design and construction; Drainage and maintenance problems in hill roads.

UNIT-IV: HIGHWAY CONSTRUCTION EQUIPMENT (9 Periods)

Excavators - Drilling rock and earth; Aggregate production – Trucks and haulage equipment, Dozers, Scrappers; Finishing equipment, Hotmix plats for bituminous mixes, Pavers and compacting equipment for hot bituminous mixes, Plants and equipment for cement concrete and paving equipment; Piles and pile driving equipment, Air compressors and pumps, Latest developments in highway construction equipment.

UNIT-V: HIGHWAY MAINTENANCE AND ROAD SIDE DEVELOPMENT (9 Periods)

Highway Maintenance: Introduction; Pavement failures; Maintenance of highways; Pavement evaluation; Strengthening of existing pavements by overlays.

Road Side Development: Environment factors in planning and development of highways; Road side development and arboriculture - Planning plantation of trees, Species and their selection, Care of trees.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Khanna, K. and Justo, C. E. G., *Highway Engineering,* Nem Chand & Bros, Roorkee, 10th Edition, 2014.
2. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Technical Publications, 7th Edition, 2010.

REFERENCE BOOKS:

1. JotinKhisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction,*Prentice Hall of India Pvt. Ltd.,3rd Edition,2016.
2. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,*Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.
3. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning,*Prentice Hall of India Pvt. Ltd., 3rd Edition, 2009.
4. Mannering, F. L. andWashburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley& Sons, Inc., 5th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Robert A. Douglas, *Low Volume Road Engineering- Design, Construction, and Maintenance*,CRC Press, 1st Edition, 2016.
2. Samantha R. Jones, *Highways-Construction, Management, and Maintenance*, Nova Science Publisher's, 1st Edition, 2010.
3. Watson, J.P., *Highway Construction and Maintenance*, Longman Scientific & Technical, 2nd Edition, 1994.

IV B.Tech - I Semester

(20BT70104)**INDUSTRIAL WASTEWATER TREATMENT**

(Professional Elective – 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PREREQUISITES: Course onEnvironmental Engineering

COURSE DESCRIPTION: Characteristics ofindustrial wastewater; Primary and secondary treatment; Advanced treatment systems; Typical industrial wastewater treatment; Wastewater minimization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the characteristics of industrial wastewater to solve industrial waste water problems following the relevant standards and codes considering society, health, safety and environment besides communicating effectively in graphical form.

CO2. Designprimary and secondary treatment units to provide solutions to the complex problems of industrial wastewater treatment using appropriate techniques following the relevant standards and codes considering society, health, safety and environment besides communicating effectively in graphical form.

CO3. Analyzethe advanced treatment systems to solve complex environmental problems using appropriate techniques following latest developments considering the society, health, safety and environment besides communicating effectively in graphical form.

CO4. Analyze the characteristics and treatment of wastewater from different industries to provide solutions to complex environmental problems using appropriate techniques following the relevant standards and codes considering the society, health, safety and environment besides communicating effectively in graphical form.

CO5. Analyze the wastewater minimization techniques to solve complex environmental problems following latest developments considering society, health, safety, environment and project management besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs:

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3				3	3	2		1					3
CO2	6	1	2	3	2	2	3	3	2		1					3
CO3	4	2	3		2	2	3	3			1		1			3
CO4	4	2	3		2	2	3	3	2		1					3
CO5	4	2	3		2	2	3	3			1	1	1			3
Average		1.8	2.8	3	2	2	2	2	2		1		1			3
Course Correlation Level		2	3	3	2	2	2	2	2		1	1	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: CHARACTERISTICS OFINDUSTRIAL WASTEWATER (08 Periods)
Industrial sources of wastewater and characteristics, Significance in determination of characteristics for different industrial effluents, Pattern of pollution and self-purification of rivers, ISI tolerance limits for disposal of effluent into inland surface water and public sewers.

UNIT – II: PRIMARY AND SECONDARY TREATMENT (10 Periods)
Primary Treatment - Scope, Working principle,Functions and Design of Equalization, Neutralization, Screen chamber, Grit chamber and Primary sedimentation tanks; Secondary Treatment - Microbiological metabolism - Basic kinetic equations, Biological treatment kinetics, Growth kinetics, Oxygen requirement in aerobic process and Design of complete mix conventional biological treatment facilities.

UNIT – III: ADVANCED TREATMENT SYSTEMS (09 Periods)
Pollution characteristics, Toxic chemicals, Treatments –Oxidation and reduction systems, Thermal reduction, Air stripping, Membrane systems; Nitrogen removal by biological nitrification and denitrification, Phosphate removal by activated sludge process and anaerobic filters

UNIT – IV: TYPICAL INDUSTRIAL WASTEWATER TREATMENT (09 Periods)
Origin, Characteristics and treatment of wastewater - Paper mills, Sugar mills, Breweries, Wineries, Distilleries, Tanneries, Textile mills and dairy units.

UNIT – V: WASTEWATER MINIMIZATION (09 Periods)
In-plant survey, Flow measurement, Composition of wastewater generated, Analytical methods recommended for characterization, Waste volume and strength reduction, Water conservation, Factors encouraging the waste minimization, Clean-up and cleaner technologies, Remediation, Hierarchy of waste management options.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Rao, M.N., and Dutta, A.K., *Waste Water Treatment,* Oxford and IBH Publishers, 3rd Edition, 2009.
2. Metcalf and Eddy, *Wastewater Engineering, Treatment and Reuse,* Mc.Graw Hill Education Private Limited, 4th Edition, 2010.

REFERENCE BOOKS:

1. Newmerow, *Liquid Waste of Industry,* Pearson Education Publishing Co., New Delhi, 1971.
2. Mark J. Hammer and Mark J. Hammer Jr., *Water and Wastewater Technology,* Pearson Education Publishing Co., New Delhi, 6th Edition, 2008.
3. Patwardhan, A.D., *Industrial Wastewater Treatment*, PHI Publisher, 2008.
4. Rakesh Kumar and Singh,R.N., *Municipal Water and Wastewater Treatment*, TERI, 2009.
5. Peavy, H.S., Rowe, D.R., Tchobanoglous, G., *Environmental Engineering*, McGraw-Hill Book Co., New Delhi, 1995.

ADDITIONAL LEARNING RESOURCES:

1. Glynn Henry, J. and Gary W. Heinke, *Environmental Science and Engineering*, Printice Hall of India Pvt. Ltd., New Delhi, 2nd Edition, 2004.
2. James E. Bailey and David F. Ollis, *Biochemical Engineering Fundamentals*, McGraw Hill Education Private Limited, Singapore,2ndEdition, 1986.
3. Santosh Kumar Garg, *Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, New Delhi, 27th Edition, 1st Reprint, 2013.
4. *Manual on Water Supply and Treatment*, CPHEEO, Government of India, New Delhi, 1999.
5. *Manual on Sewerage and Sewage Treatment*, CPHEEO, Govt. of India, New Delhi, 1993.

IV B.Tech. - ISemester

(20BT70105) INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

(Professional Elective – 3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Construction Planning and Project Management.

COURSE DESCRIPTION: Infrastructure development; Overview of Indian infrastructure – Tenders, Contracts and specifications; Policies on infrastructure development; Construction and infrastructure; Infrastructure management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the impact of infrastructure development on society, economy and environment to solve infrastructure problems ensuring sustainability.

CO2. Analyze the Indian infrastructure to solve infrastructure problems following relevant government policies and regulations considering society, environment,sustainability and finance.

CO3. Analyze the policies on infrastructure development to solve complex infrastructure problems considering society, environment andsustainability.

CO4. Analyze the construction components of various infrastructure sectors to solve complex infrastructure problems following government policies and regulations considering society, environment and sustainability.

CO5. Analyze the infrastructure management in various sectors to solve infrastructure problems using appropriate tools and techniques following relevant guidelines, policies and regulationsconsidering society, environment and sustainability.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3				2	1				2		3		
CO2	4	3	3				2	1	1			2		3		
CO3	4	3	3		2		2	1	1					3		
CO4	4	3	3		2		1	1						3		
CO5	4	3	3			2	1	1	1			3		3		
Average		3	3		2	2	1.60	1	1			2.33		3		
Course Correlation Level		3	3		2	2	2	1	1			3		3		

Correlation Levels: 3:H – High 2:M – Medium 1:L - Low

DETAILED SYLLABUS:

UNIT – I: INFRASTRUCTUREDEVELOPMENT (09 Periods)

Impact of infrastructure development on economic growth, standard of living and environment; Reasons for rise of public sector and government involvement in infrastructural activities, Changed socio-economic scenario and current problems and related issues.

UNIT – II: OVERVIEW OF INDIAN INFRASTRUCTURE (09 Periods)

***Indian Infrastructure*:** Energy, Power, Water resources, Dams, Bridges, Canals, Rural Infrastructure, Urban Infrastructure, Housing, Roads, Railways, Ports, Airports, Social Infrastructure, Education, Health care, Infrastructure deficiencies.

***Tenders, Contracts and Specifications*:**Public Private Partnership (PPP) contracts, Turnkey contracts, FIDIC clauses.

UNIT – III: POLICIES ON INFRASTRUCTURE DEVELOPMENT (09 Periods)

A historical review of the government policies on infrastructure; Current public policies on transportation, power and telecom sectors; Plans for infrastructure development; Legal framework for regulating private participation -Roads and highways, Ports and airports, Power and telecom.

UNIT – IV: CONSTRUCTION AND INFRASTRUCTURE (09 Periods)

Construction component of various infrastructure sectors: Highways, Ports and aviation, Oil and gas, Power, Telecom, Railways, Irrigation; Current scenario, Future needs, Investment needed, Regulatory framework, Government policies and future plans, Technological and methodological demands on construction management in infrastructure development projects.

UNIT – V: INFRASTRUCTURE MANAGEMENT (09 Periods)

Importance, scope and role in different sectors of construction

- ***Highway Sector*:** Repayment of Funds, Toll Collection Strategy, Shadow tolling, and direct tolls, Maintenance strategy, Review of toll rates & structuring to suit the traffic demand.
- ***Irrigation Projects*:** Large / Small Dams, Instrumentation, Monitoring of water levels, Catchments area, Rainfall data management, Prediction, Land irrigation planning & policies, Processes Barrages, Canals.
- ***Power Projects*:** Power scenario in India, Estimated requirement, Generation of power distribution strategies, National grid, Load calculation & factors, Hydropower, Day to day operations, Management structures, Maintenance, Thermal Power, Nuclear Power.
- ***Airports:*** Requisites of domestic and International airports, Cargo and military airports, Facilities available, Terminal management, ATC.
- ***Railways:*** Mass Rapid Transport System MRTS, LRT, Multi–modal Transport System.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. NarindarJetli, K. and Vishal Sethi,*Infrastructure Development in India Post LiberalizationInitiatives and Challenges*, New Century Publications, 2007.
2. Raghuram, G. and Jain, R., *Infrastructure Development and Financing: Towards a Public–Private Partnership*, Macmillan India Ltd., 1999.

REFERENCE BOOKS:

1. Joshi, R. N., *Public Private Partnership in Infrastructure Perspectives, Principles, Practice*, Vision Books, 2000.
2. Prasanna Chandra, *Projects: Planning, Analysis, Selection, Financing, Implementation and Review*, Mc. Graw Hill Education, 8th Edition, 2014.
3. Murty, G. R. K., *Infrastructure Projects: Current Financing Trends,* ICFAI University Press, 2006.
4. AnupChatterjee, NarindeJetli, K. and Vishal Sethi*, Industry and Infrastructure Development inIndia Since 1947*, New Century Publications, 2009.

ADDITIONAL LEARNING RESOURCES:

1. Hudson, W., Ralph Haas, Waheed Uddin, *Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation*, McGraw-Hill Publications, 1997.
2. Alvin Goodman, Makar and Hastak, *Infrastructure Planning Handbook*, McGraw-Hill Publications, 2006.

IV B.Tech. – I Semester

(20BT70106) LAND SURVEY AND REAL ESTATE DEVELOPMENT

(Professional Elective–3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Surveying.

COURSE DESCRIPTION: Land survey and layouts; Building bye–laws and regulations; Real estate development; Retail real estate; Portfolio and real estate management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze land survey and layouts to solve real estate problems using appropriate techniques by following relevant standards and codes considering society, environmentbesides communicating effectively in graphical form.

CO2. Analyze building bye-laws and regulations to solve real estate problems by following latest developments considering society, environment besides communicating effectively in graphical form.

CO3. Analyze real estate development to solve real estate problems following relevant standards, regulations and latest developments considering society, finance and project management.

CO4. Analyze retail real estate to solve real estate problems following relevant standards, regulations and latest developments considering society, finance and project management.

CO5. Analyze portfolio and real estate management to solve the real estate problems using appropriate techniques following relevant standards, regulations and latest developments considering society, finance and project management.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3			1	2	1	2		1					3
CO2	4	3	3			1	2	1	2		1		1			3
CO3	4	3	3			2	2		2			1	1			3
CO4	4	3	3			2	2		2			1	1			3
CO5	4	3	3			2	2		2			1	1			3
Average		3	3			1.6	2	1	2		1	1	1			3
Course Corelation Level		3	3			2	2	1	2		1	1	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT- I: LAND SURVEY AND LAYOUTS (08 Periods)

Field surveying- Definition and objectives; Concept of geoid and reference spheroids, Coordinate systems, Plane and geodetic surveys; Maps- Types, Importance, Scales or centre line, Conventional symbols and generalization; Topographic maps, Map projection systems, Sheet numbering systems, Map layout; Engineering project surveys- Requirements and specifications.

UNIT – II: BUILDING BYE–LAWS AND REGULATIONS (10 Periods)

Meaning of terms of law, legislation, ordinance, bill, act, regulation and bye-laws; Significance of law and its relationship to urban planning, Benefits of statutory backing of schemes, Law of eminent domain and police powers, Evolution of planning legislation – A brief history of planning legislation in India and abroad, Town and country planning act 1957, Improvement trust act 1961, Development authorities act 1957, State housing board act, Land acquisition act 1986, Urban land (ceiling and regulation) act 1976, Slum areas (improvement and clearance)act 1956, Rent control act1946, Apartment ownership act 1983; Significance of land development controls – Zoning, Subdivision regulations, Building regulation and bye-laws; Land layout development.

UNIT - III: REAL ESTATE DEVELOPMENT (09 Periods)

Organizational set up and itsfunctions, General procedure for development permission, Authorities and discretionary powers, Duties of staff, Policy decisions; Documents from owner, architect or surveyor;Permissions by corporation, Finance for investment in real properties, FDI, Method of valuation - Open lands, Rental method, Capital value, Outgoings, Depreciation,Valuation of licensed premises.

UNIT- IV: RETAIL REAL ESTATE (09 Periods)

Merchandising, Warehousing, Franchising, Shopping malls, General free and unfree tenure, Land system in India, Concept of term value, Different forms of value, Supply and demand forces, Occupation value and investment value, Factors affecting changes in market value, Classification of values, Building redevelopment proposal, Slum rehabilitation and development schemes, Latest developments.

UNIT - V: PORTFOLIO AND REAL ESTATE MANAGEMENT (09 Periods)

Risk management in real estate, Strategic business risks and corporate real estate, Competitive risks; Managing portfolio - Property assets, Contracts and relationships, Workplace and infrastructure; Risk management - Financial risks, Property market risks, Business risks, Understanding risks and informing decision making; Business ethics - Normative ethics, Prescriptive ethics, Applied ethics, Concept of right and duty, Definition and scope relevance in social changes, Corporate code of conduct.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Mike E. Miles, Laurence M. Netherton and Adrienne Schmitz, *Real Estate Development: Principles and Process*, Urban Land Institute, 5th Edition, 2015.
2. Rena Mourouzi-Sivitanidou and Petros Sivitanides, *Market Analysis for Real Estate*, Routledge, 1st Edition, 2020.

REFERENCE BOOKS:

1. Charles D. Ghilani, *Elementary Surveying - An Introduction to Geomatics*, Pearson India Education Services Pvt. Ltd, 13th Edition, 2018.
2. David L. Cleland and Lewis R. Ireland, *Project Management: Strategic Design and Implementation,* McGraw-Hill Education; 5th Edition, 2006.
3. Downs, J.C., *Principles of Real Estate Management*, Institute of Real Estate Management, 1980.
4. Dutta, B.N., *Estimating and Costing in Civil Engineering,* CBS Publishers & Distributors Private Limited, 28th Edition, 2020.

ADDITIONAL LEARNING RESOURCES:

1. National Building Code of India 2016.

IV B.Tech. – ISemester

(20BT70107)**SOIL DYNAMICS AND MACHINE FOUNDATIONS**

(Professional Elective – 3)

Int. Marks	Ext. Marks	Total	L	T	P	C
30	70	100	3	-	–	3

PRE-REQUISITES: Courses on Soil Mechanics and Foundation Engineering.

COURSE DESCRIPTION: Fundamentals of vibration; Frequency of soil systems; Wave propagation; Dynamic soil properties; Vibration analyses; Designof machine foundations; Machine foundationson piles; Vibration isolation.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze vibration; and frequency of soil systems to solve complex problems of soil dynamics using appropriate techniques through continuous learning by ensuring safety and environment besides communicating effectively in graphical form.

CO2. Analyze wave propagation and dynamic soil properties to solve complex problems of soil dynamics using appropriate tools and techniques by following the relevant codes of practice by ensuring safety and environment besides communicating effectively in graphical form.

CO3. Analyze vibrations in soils to solve complex problems of soil dynamics using appropriate techniques by following the relevant codes of practice by ensuring safety and environment besides communicating effectively in graphical form.

CO4. Design machine foundations to solve complex problems of soil dynamics using appropriate techniques by following the relevant codes of practice by ensuring safety, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze machine foundations on piles and vibration isolation techniques to solve complex problems of soil dynamics by following the relevant codes of practice by ensuring safety, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		2	1	1	1			1		1		3	
CO2	4	2	3		2	1	1	1	2		1				3	
CO3	4	2	3		2	1	1	1	1		1				3	
CO4	6	2	2	3	2	1	1	1	2		1				3	
CO5	4	2	3		2	1	1	1	1		1				3	
Average		2	2.80	3	2	1	1	1	1.50		1		1		3	
Course Correlation Level		2	3	3	2	1	1	1	2		1		1		3	

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: FUNDAMENTALS OF VIBRATION AND FREQUENCY OF SOIL SYSTEMS (09 Periods)

Fundamentals of Vibration: Definitions, Simple harmonic motion, Free and forced vibrations with and without viscous damping, Frequency dependent excitation, Systems under transient loads, Rayleigh's method of fundamental frequency, Logarithmic decrement, Latest methods.

Frequency of Soil Systems:Determination of viscous damping, Transmissibility,Systems with two and multiple degrees of freedom, Vibration measuring instruments, Latest methods.

UNIT – II: WAVE PROPAGATION AND DYNAMIC SOIL PROPERTIES (09 Periods)

Wave Propagation: Propagation of seismic waves in soil deposits, Attenuation of stress waves, Stress–strain behavior of cyclically loaded soils, Strength of cyclically loaded soils.

Dynamic Soil Properties:Dynamic soil properties, Laboratory and field testing techniques, Elastic constants of soils; Correlations for shear modulus and damping ratio in sands, gravels, clays and lightly cemented sand; Liquefaction of soils.

UNIT- III: VIBRATION ANALYSES (09 Periods)

Types, General requirements, Permissible amplitude, Allowable soil pressure, Modes of vibration of a rigid foundation block, Methods of analyses, Lumped mass models, Elastic half space method, Elastodynamics, Effect of footing shape on vibratory response, Dynamic response of embedded block foundation.

UNIT – IV: DESIGN OF MACHINE FOUNDATIONS (09 Periods)

Analysis and design of block foundations for reciprocating engines, Dynamic analysis and design procedure for a hammer foundation, IS Code of practice, Design procedure for foundations of reciprocating and impact type machines.

UNIT – V: MACHINE FOUNDATIONS ON PILES AND VIBRATION ISOLATION (09 Periods)

Machine Foundations on Piles: Introduction, Analysis of piles under vertical vibrations, Analysis of piles under translation and rocking, Analysis of piles under torsion, Design procedure for a pile supported machine foundation.

Vibration Isolation:Types and methods of isolation, Active isolation and passive isolation, Dynamic properties of isolation materials.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Braja M. Das and Ramana, G.V., *Principles of Soil Dynamics,*Cengage Learning, 2nd Edition, 2011.
2. Srinivasalu, P. and Vaidyanathan, C., *Hand Book of Machine Foundations,* Tata McGraw–Hill, 2007.

REFERENCE BOOKS:

1. Suresh C. Arya, Michael O'neill, W. and George Pincus, *Design of Structures and Foundations for Vibrating Machines,* Gulf Publishing Company, 1979.
2. Shamsher Prakash, *Soil Dynamics,* McGraw Hill, 1981.
3. Swami Saran, *Soil Dynamics and Machine Foundations,* Galgotia Publications Pvt. Ltd., 2nd Edition, 2010.
4. Kameswara Rao,N. S. V., *Vibration Analysis and Foundation Dynamics,* Wheeler Publishing, 1998.

ADDITIONAL LEARNING RESOURCES:

1. Richart, Hall and Woods, *Vibration of Soils and Foundations*, Prentice Hall, 1970.
2. Shamsher Prakash and Vijay Kumar Puri, *Foundations for Machines: Analysis and Design,* Wiley, 1988.

IS CODES:

IS 2974 – 1982 : Design and Construction of Machine Foundations.

IV B.Tech. I Semester

(20BT70108) **SUSTAINABLE WATER RESOURCES DEVELOPMENT**

(Professional Elective -3)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Engineering Hydrology, Irrigation Engineering and Hydraulic Structures.

COURSE DESCRIPTION: Challenge of water sustainability; Water Economics; Sustainable Planning Approaches; Sustainable Practicesfor water resources management; Integrated Management of Water Supply.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze global water issues and challenges to solve water resource problems considering latest developments, relevant guidelines, society, environment, and sustainability besides communicating effectively in graphical form.

CO2. Analyze water resource economics as linked to hydrology, ecology, pollution, consumptive and non-consumptive uses for solving complex problems considering latest developments, relevant guidelines, society, environment, and sustainability besides communicating effectively in graphical form.

CO3. Analyze sustainable planning approachesof water resources to solve complex problems considering relevant guidelines, latest developments and society besides communicating effectively in graphical form.

CO4. Analyze sustainable practices to solve complex water resources problems using best management practices considering latest developments, relevant guidelines, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze integrated management of water supply methods to solve complex water resources problems considering latest developments, relevant guidelines, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3				2	1	1		1		1			3
CO2	4	2	3		2		2	1	1		1	1	1			3
CO3	4	2	3		2		2	1	1		1		1			3
CO4	4	2	3		2	2	2	1	1		1	1	1			3
CO5	4	2	3		2	2	2	1	1		1	1	1			3
Average		2	3		2	2	2	1	1		1	1	1			3
Course Correlation Level		2	3		2	2	2	1	1		1	1	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT I–CHALLENGES OF WATER SUSTAINABILITY (09 periods)

Water as a global issue - Key challenges, Need and importance of water resources; Ecosystem services, Water security, Sustainable water use; Overview of water resources – rivers, streams, groundwater and aquifers, lakes and reservoirs, wetlands and coastal zones; Global warming, Climate change and its impacts.

UNIT II –WATER ECONOMICS (09 periods)

Economic view of water issues, Economic characteristics of watergoods and services, International funding organizations, Non-market monetary valuation methods, Water economic instruments, Policy options for water conservation and sustainable use – Case studies; Pricing -Distinctionbetween values and charges; Private sector involvement in water resources management - PPP Objectives, Options, Processes, Experiences through case studies, Linksbetween PPP and IWRM.

UNIT III – SUSTAINABLE PLANNING APPROACHES (09 periods)

National laws, Acts and Policies; Watershed planning, Tools for water resource analysis, Stormwater management and erosion control, Land use planning and management, Urban hydrology -Existing systems, Impervious cover model,Trees in urban watersheds; Groundwater protection - A Sustainable approach, Data at the local and national levels.

UNIT IV – SUSTAINABLE PRACTICES FOR WATER RESOURCES MANAGEMENT (09 periods)

River, Lake and Wetland restoration; Low-impact development and smart growth, Recreational use, Wildlife management and habitat restoration, New lakes, Reservoirs and dams,Land acquisition, Best management practices - Structural and nonstructural, Vegetative Practices, Runoff and sediment control, Wetlands; Rainwater harvesting.

UNIT V – INTEGRATED MANAGEMENT OF WATER SUPPLY (09 periods)

Integrated management of water supply for large cities, Managing water supply using groundwater recharge, Assessment of surface storage requirement, Using flood water for artificial recharge and space irrigation, Optimal usage of irrigation water, Watershed approach for controlling erosion and non-point source pollutants to water bodies, Environment impact assessment of water resources – Objectives, Advantages and limitations.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Sipes, J., *Sustainable Solutions for Water Resources Policies, Planning and Implementation*, John Wiley & Sons, Inc., 1st Edition, 2010.
2. MaysL, W., *Water Resources Sustainability*, McGraw-Hill Education, 1st Edition, 2007.

REFERENCE BOOKS:

1. Ojh, C.S.P., Berndtsson, R., and Bhunya, P.,*Engineering Hydrology*, Oxford University Press, 1st Edition, 2008.
2. Lenton, R., and Muller, M., *Integrated Water Resources Management in Practice*, MPG Books 1st Edition, Ltd., 2015.
3. Grigg, N.S., *Integrated Water Resources Management,* Macmillan Publishers Ltd., 1st Edition, 2016.
4. Setegn, S.G., and Donoso, M.C., *Sustainability of Integrated Water Resources Management,* Springer International Publishing Switzerland, 1st Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Biswas, A.K., and Cecilia, T., Water Security, *Climate Change and Sustainable Development*, Springer Singapore, Heidelberg, New York, 1st Edition, 2016.
2. Shukla, V., and Kumar, N., *Environmental Concerns and Sustainable Development*, Springer Nature Singapore Pte Ltd., 1st Edition, 2020.

IV B.Tech. - I Semester

(20BT70109) **ADVANCED FOUNDATION ENGINEERING**

(Professional Elective – 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses onSoil Mechanics and Foundation Engineering.

COURSE DESCRIPTION: Shallow foundations - Bearing capacity, Settlements, Design principles; Pile foundations – Bearing Capacity, Settlements, Design; Sheet pile walls; Foundations on expansive soils; Marine substructures.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design shallow foundations to solve complex foundation engineering problems using appropriate techniquesby following relevant codes of practice considering society, environment and sustainability besides communicating effectively in graphical form.

CO2. Design pile foundations to solve complex foundation engineering problems using appropriate techniques by following relevant codes of practice considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Design sheet pile walls based on ground characteristics for its stabilityto solve complex foundation engineering problemsusing appropriate techniques by following relevant codes of practice considering society, environment and sustainability besides communicating effectively in graphical form.

CO4. Designunder reamed piles and breakwaters to solve complex foundation engineering problems using appropriate techniques by following relevant codes of practice considering society, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyze different foundation techniques in expansive soils to solve complex foundation engineering problems by following the ethics and considering society, environment and sustainability besides communicating effectively in graphical form.

CO6. Analyze marine substructures to solve complex marine engineering problems by following the ethics and considering society, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	3	2	3	2	2	1	1	2	-	2	-	-	-	3	-
CO2	6	3	2	3	2	2	1	1	2	-	2	-	-	-	3	-
CO3	6	3	2	3	2	2	1	1	2	-	2	-	-	-	3	-
CO4	6	3	2	3	2	2	1	1	2	-	2	-	-	-	3	-
CO5	4	3	3	-	2	2	1	1	2	-	2	-	-	-	3	-
CO6	4	3	3	-	2	-	1	1	2	-	2	-	-	-	3	-
Average		3	2.33	3	2	2	1	1	2	-	2	-	-	-	3	-
Course Correlation Level		3	3	3	2	2	1	1	2	-	2	-	-	-	3	-

Correlation Levels: 3: H - High 2: M - Medium 1: L– Low

DETAILED SYLLABUS:

UNIT-I: SHALLOW FOUNDATIONS (09 Periods)

Theories of bearing capacity–Hansen, Vesic; Effect of tilt, eccentricity, compressibility, non–homogeneity and anisotropy of soil on bearing capacity; Bearing capacity of footings resting on stratified soils, on slope and on top of the slopes, Settlement of foundation – 3D consolidation settlement; Bearing pressure using SPT, CPT, Dilatometer and Pressure meter, Design principles - Isolated,Combined footing and mat foundation (conventional rigid method only).

UNIT–II: PILE FOUNDATIONS (10 Periods)

Bearing capacity of vertically loaded piles - Static capacity-α, β and λ Methods, IS Code; Dynamic pile capacity – Simplex and Janbu methods; Point bearing resistance with SPT and CPT results; Bearing resistance of piles on rock, Uplift resistance, Laterally loaded piles, Ultimate lateral resistance, Batter piles, Under reamed piles, Mini and micro piles; Ultimate capacity of pile groups in compression, Pullout andlateral load, Efficiency;Settlements of pile groups, Design of simple R.C.C piles.

UNIT – III: SHEET PILE WALLS (09 Periods)

Sheet pile structures, Cantilever sheet pile walls in granular soils and cohesive soils, Anchored bulk head – Free earth support method, Fixed earth support method; Lateral earth pressure on braced sheet pile walls.

UNIT – IV: FOUNDATIONS ON EXPANSIVE SOILS (08 Periods)

Expansive soils - Nature, identification and classification; Foundations in black cotton soils – Basic foundation problems associated with black cotton soils, Lime column techniques, Use of Cohesive Non Swelling (CNS) layer below shallow foundations; Underreamed piles – Principle of functioning of underreamed pile, Analysis and design of underreamed pile.

UNIT–V: MARINE SUBSTRUCTURES (09 Periods)

Introduction, Types of marine structures – Breakwaters, Wharves, Piers, Seawalls, Docks, Quay walls; Design loads, Wave action, Wave pressure on vertical wall, Ship impact on piled wharf structure, Design of rubble mount breakwater and wall type breakwater.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Donald P. Coduto, *Foundation Design Principles and Practices*,Pearson, 3rd Edition, 2015.
2. Swami Saran, *Analysis and Design of Substructures – Limit State Design,* Oxford & IBH Publishing Company Pvt. Ltd., 2nd Edition 2018.

REFERENCE BOOKS:

1. Murthy, V. N. S.,*Text Book of Soil Mechanics and Foundation Engineering,* CBS Publishers & Distributors Pvt. Ltd., 3rd Edition, 2018.
2. Braja M. Das, *Principles of Foundation Engineering,* Cengage Learning India, 9th Edition, 2017.
3. Bowles J.E., *Foundation Analysis and Design,* McGraw–Hill Publishing Company, 5th Edition, 2001.
4. Shamsher Prakash, GopalRanjan and Swami Saran, *Analysis and Design of Foundations and Retaining Structures,* Sarita Publishers, 2nd Edition, 1987.

ADDITIONAL LEARNING SOURCES:

1 Murthy, V. N. S.,*Advanced Foundation Engineering,* CBS Publishers & Distributors Pvt. Ltd., 1st Edition, 2017.
2 Sitharam, T. G.,*Advanced Foundation Engineering,* CRC Press, 1st Edition, 2017.

IS CODES:

IS 1080 – 1985	:	Design and Construction of Shallow Foundations in Soils (Other than Raft, Ring and Shell).
IS 2911 (Part 1/Sec 3) - 2010	:	Design and Construction of Pile Foundations.
IS 6403 - 1981	:	Determination of Bearing Capacity of Shallow Foundations.

IV B. Tech. – I Semester

(20BT70110) **ADVANCED STEEL STRUCTURES**

(Program Elective - 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses onStructural Analysis, Steel Structures.

COURSE DESCRIPTION: Light gauge steel sections;Weldedplate girders; Gantry girder; Steel water tanks; Steel-composite construction.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Designlight gauge steel section to solve complex problems associated with steel structures using appropriate techniques following relevant codes considering safety and stability besides communicating effectively in graphical form.

CO2. Designwelded plate girders to solve complex problems associated with steel structures using appropriate techniques following relevant codes considering safety and stability besides communicating effectively in graphical form.

CO3. Designgantry girders to solve complex problems associated with steel structures using appropriate techniques following relevant codes considering safety and stability besides communicating effectively in graphical form.

CO4. Designsteel water tanks to solve complex problems associated with steel structures using appropriate techniques following relevant codes considering safety and stability besides communicating effectively in graphical form.

CO5. Designsteel concrete composite construction to solve complex problems associated with steel structures using appropriate techniques following relevant codes considering safety and stability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs:

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	1	2	3	2	1	2		2		2			3		
CO2	6	1	2	3	2	1	2		2		2			3		
CO3	6	1	2	3	2	1	2		2		2			3		
CO4	6	1	2	3	2	1	2		2		2			3		
CO5	6	1	2	3	2	1	2		2		2			3		
Average		1	2	3	2	1	2		2		2			3		
Course Correlation Level		1	2	3	2	1	2		2		2			3		

Correlation Levels: H: High M: Medium L: Low

DETAILED SYLLABUS:

UNIT - I: LIGHT GAUGE STEEL SECTIONS (09 periods)
Types of section, Material, Local Buckling of thin elements, Stiffened compression elements, Unstiffened compression elements, Compression members, Flexural members – Laterally supported and Unsupported flexural members, Connections.

UNIT – II: WELDED PLATE GIRDER (10 periods)
Design of cross section of plate girders; Design of end stiffeners, intermediate stiffeners, bearing stiffeners and horizontal stiffeners.

UNIT - III: GANTRY GIRDER (09 periods)
Gantry girder impact factors, Longitudinal forces, Design of gantry girders.

UNIT - IV: STEEL WATER TANKS (09 periods)
Specifications, Design of rectangular pressed steel tank.

UNIT - V: STEEL - CONCRETE COMPOSITE CONSTRUCTION (08 periods)
Design principles, Shear connections, Composite beam design.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:
1. Punmia,B. C., Ashok Kumar Jain and ArunKumar Jain, *Design of Steel Structures,* Laxmi Publications, 2nd Edition, 2013.
2. Johnson,R.P., *Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings-Vol.I*, Blackwell Scientific Publications, 2004.

REFERENCE BOOKS:
1. Ramachandra,S.,*Design of Steel Structures*, Dhanpat Rai Publishing Company, 2nd Edition, 2016.
2. Arya, A. S., Ajmani, J.L., *Design of Steel Structures*, Nem Chand & Bros, 5th Edition, 2001.
3. Duggal,S. K.,*Limit State Design of Steel Structures*, McGraw Hill, 3rd Edition, 2019.
4. Subramanian, N.,*Design of Steel Structures*, Oxford University Press, 2nd Edition, 2018.

ADDITIONAL LEARNING RESOURCES:
1. Lynn S. Beedle, *PlasticDesign of Steel Frames*, John Wiley and Sons, 1990.
2. Narayanan, R.,*Teaching Resource on Structural Steel Design*, INSDAG, Ministry of Steel Publishing, 2000.
3. Wie Wen Yu, *Design of Cold Formed Steel Structures*, Mc Graw Hill Book Company, 1996.
4. Bhavikatti,S. S.,*Design of Steel Structures by Limit State Method as Per IS: 800-2007*, I. K. International Publishing House Pvt. Ltd., 5th Edition, 2017.

IS Codes:

IS 811-1987	: Cold Formed Light Gauge Structural Steel Sections
IS 800 - 2007	:Indian Standard General Construction in Steel
IS 805 - 2006	:Code of Practice for Use of Steel in Gravity Water Tanks
IS 11384 - 1985	:Code of Practice for Composite Constructionin Structural Steel and Concrete
IS 811 - 1987	:Specifications for Cold Formed Light Gauge Structural Steel Sections

IV B. Tech. – I Semester

(20BT70111) **ENVIRONMENTAL HYDRAULICS**

(Professional Elective–4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Engineering Hydrology,Fluid Mechanicsand Environmental Engineering.

COURSE DESCRIPTION: Eco-hydrological background, Water uses, Hydraulic principles and Eco-friendly design approach, Water hazards and their management, Eco-technological practices for sustainable development.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze eco-hydrological Processes for solving environmental hydraulic problemsusing different tools and techniques considering society, environment, and sustainability besides communicating effectively in graphical form.

CO2. Analyze water uses for solving environmental hydraulic problems using different techniques considering relevant guidelines, society, environment and sustainability besides communicating effectively in graphical form.

CO3. Designeco-friendly water systems for solving complex environmental hydraulic problems using different tools and techniques, relevant guidelines, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze water hazard classes for solving complex environmental hydraulic problems using different tools and techniques considering latest developments, relevant guidelines, safety, environment and sustainability besides communicating effectively in graphical form.

CO5. Analyzeeco-technologicalwater management practices for solving complex environmental hydraulicproblems using different tools and techniques considering latest developments, relevant guidelines, safety, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3	-	2	-	-	1	-	-	1	-	-	-	-	3
CO2	4	2	3	-	2	2	2	1	1	-	1	-	-	-	-	3
CO3	6	1	2	3	2	2	2	1	1	-	1	-	-	-	-	3
CO4	4	1	2	-	2	2	2	1	1	-	1	-	1	-	-	3
CO5	4	2	3	-	-	2	2	1	1	1	1	-	1	-	-	3
Average		1.60	2.60	3.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	-	1.00	-	-	3.00
Course Correlation Level		2	3	3	2	2	2	1	1	1	1	-	1	-	-	3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT - I: ECO-HYDROLOGICAL BACKGROUND (09 Periods)

Environmental Hydrology in General, Hydrologic Cycle and its Processes, Rainfall-Runoff-Infiltration-Evaporation Analysis, The Water Balance, Water Bodies.

UNIT - II: WATER USES (09 Periods)

Introduction, Water supply for Rural and Urban Neighborhoods, Water for Agriculture, Water for Industries, Water for Hydropower Generation, Water for Navigation, Water for Pisciculture, Water for Recreation.

UNIT - III: HYDRAULIC PRINCIPLES AND ECO-FRIENDLY DESIGN APPROACH (10 Periods)

Conservation Principles in General, Mass Conservation Principle and Applications, Energy Conservation Principle and Applications, Momentum Conservation Principle and Applications, Angular Momentum Conservation Principlesand Applications, Flow Measurement Devices in Pipes and Open Channels, Basic Considerations for Eco-friendly Design ofWater Systems.

UNIT - IV: WATER HAZARDS AND THEIR MANAGEMENT (09 Periods)

Overview of hazards, Water and the nature of its Pollution, Flood Disaster and its Management, Landslide Hazards and their Management, Disaster due to Collapse of Dams, Hazards due to Droughts, Information and System Organization forDisaster Mitigation.

UNIT - V: ECO-TECHNOLOGICAL PRACTICES FOR SUSTAINABLE DEVELOPMENT (08 Periods)

Introduction, Traditional Water Conservation Practices, Recent Eco-Technological Practices, Sustainable Development through IntegratedWater Management.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Ghosh,S.N. and Desai, V.R., *Environmental Hydrology and Hydraulics*, Science Publishers,1st Edition, 2006.
2. Ward,A. D., Trimble,S. W., Burckhard,S. R. and Lyon, J. G. *Environmental Hydrology*, CRC Press, 1st Edition, 2016.

REFERENCE BOOKS:

1. Eslamian, S., *Handbook of Engineering Hydrology: Environmental Hydrology and Water Management*, CRC Press, 1st Edition, 2014.
2. Singh,V. P. and Hanger, W. H., *Environmental Hydraulics*, Springer Nature, 1996.
3. Tsanis, I., Huihua,J.W. and Valeo, S. C., *Environmental Hydraulics*, Elsevier Science, 1st Edition, 2006.
4. Tanguy, J.M., *Environmental Hydraulics*, Wiley Publication, 1st Edition, 2010.

ADDITIONAL LEARNING RESOURCES:

1. French, R. H., McCutcheon, S C. and Martin, J. L., *Environmental Hydraulics* (Chapter 5),*Hydraulic Design Handbook*, McGraw-Hill Professional, New York, NY, 5.1-5.33, (1999).
2. Ramos, H.M., Carravetta, A., Nabola, A. Mc. and Adeyeye K., *Environmental Hydraulics Research*, Water 2020, 12, 2749; doi:10.3390/w12102749.

IV B. Tech. – I Semester

(20BT70112) PAVEMENT ANALYSIS AND DESIGN

(Professional Elective-4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Transportation Engineering

COURSE DESCRIPTION: Factors affecting pavement design; Analysis and design of flexible pavements; Analysis and design of rigid pavements.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze factors affecting pavement design to solve complex pavement engineering problems using appropriate techniques following relevant codes considering society and environment and sustainability besides communicating effectively in graphical form.

CO2. Analyze the stresses induced in flexible pavements to solve complex pavement engineering problems using appropriate techniques following relevant codes considering safety besides communicating effectively in graphical form.

CO3. Design the flexible pavements to solve complex pavement engineering problems using appropriate methods following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.

CO4. Analyze the stresses induced in rigid pavements to solve complex pavement engineering problems using appropriate techniques following relevant codes considering safety besides communicating effectively in graphical form.

CO5. Design the rigid pavements to solve complex pavement engineering problems using appropriate methods following relevant codes considering society, environment and sustainability besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3	-	1	1	1	1	1	-	1	-	-	-	3	-
CO2	4	2	3	-	1	1	1	-	1	-	1	-	-	-	3	-
CO3	6	1	2	3	1	1	1	1	2	-	1	-	-	-	3	-
CO4	4	2	3	-	1	1	1	-	1	-	1	-	-	-	3	-
CO5	6	1	2	3	1	1	1	1	2	-	1	-	-	-	3	-
Average		1.60	2.60	3.00	1.00	1.00	1.00	1.00	1.40	-	1.00	-	-	-	3.00	-
Course Correlation Level		2	3	3	1	1	1	1	2	-	1	-	-	-	3	-

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: FACTORS AFFECTING PAVEMENT DESIGN (9 Periods)
Types of pavement, factors affecting design of pavements - elastic modulus, Poisson's ratio, wheel load, wheel configuration and tyre pressure, ESWL concept, contact pressure, material characteristics, environmental and other factors.

UNIT-II: ANALYSIS OF FLEXIBLE PAVEMENTS(9 Periods)
Stresses in flexible pavement, Layered systems concept - One layer system, Boussinesq's two-layer system, Burmister's two-layertheory for pavement design.

UNIT-III: DESIGN OF FLEXIBLE PAVEMENTS **(9 Periods)**
Theoretical, empirical and semi-empirical methods –Group index method, Burmister, CBR Method, AASHTO method, IRC method.

UNIT-IV: ANALYSIS OF RIGID PAVEMENTS **(9 Periods)**
Stresses in rigid pavements, Relative stiffness of slab, Modulus of sub grade reaction, Westergaard's equation for calculation of stresses due to wheel loads, warping load and friction load; Bradley's stress coefficients - Design charts.

UNIT-V: DESIGN OF RIGID PAVEMENTS (9 Periods)
General design approach, PCA method, AASHTO method, IRC method; Design of slab thickness, different types of joints, tie bars, and dowel barsas per IRC guidelines.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS

1. Khanna, K. and Justo, C. E. G., *Highway Engineering,* Nem Chand & Bros, 10th Edition, 2014.
2. Yang H. Huang, *Pavement Analysis and Design*,Pearson Prentice Hall, 2nd Edition,2004.

REFERENCES

1. JotinKhisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction,*Prentice Hall of India Pvt. Ltd., 3rd Edition, 2016.
2. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd,2nd Edition, 2017.
3. Yoder, E. J. and Witczack, M. W., *Principles of Pavement Design*, John Wily & Sons, New York, 2nd Edition, 1975.
4. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning,*Prentice Hall of India Pvt. Ltd., 3rd Edition, 2009.
5. Mannering, F. L. andWashburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley& Sons, Inc.,5th Edition, 2013.

ADDITIONAL LEARNING RESOURCES:

1. Papagiannakis, A.T. and Masad, E.A., *Pavement Design and Materials,* John Wily & Sons, 1st Edition, 2008.
2. Nicholas J. Garber and Lester A. Hoel, *Traffic and Highway Engineering*, Cengage Learning, 4th Edition, 2009.
3. Rajib B. Mallick and Tahat El-Korchi, *Pavement Engineering-Principles and Practice*, Taylor & Francis Group, LLC, 3rd Edition, 2018.

CODES

IRC 37- 2018 :Design of Flexible Pavements.
IRC 58 - 2015 :Design of Plain Jointed Rigid Pavements.

IV B. Tech. – I Semester

(20BT70113)**PRESTRESSED CONCRETE**

(Professional Elective –4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Structural Analysis and Reinforced Cement Concrete Structures.

COURSE DESCRIPTION: Materials for prestressed concrete; Prestressing systems**;** Analysis of prestress; Design of section for flexure and shear; Analysis of end blocks, Composite construction of prestressed and insitu concrete.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze materials and prestressing systemsto solve prestressed concrete structural problems using appropriate techniques following the relevant codes of practice ensuring safety.
CO2. Analyze prestress for flexure and losses to solve complex prestressed concrete structural problems using appropriate techniques ensuring safety.
CO3. Design a section for flexure and shear to solve prestressed concrete structural problems following the relevant codes of practice ensuring safety.
CO4. Design end blocks to solve prestressed concrete structural problemsusing appropriate techniques following the relevant codes of practice ensuring safety.
CO5. Design composite sections of prestressed and insitu concreteto solve composite construction problemsfollowing the relevant codes of practice ensuring safety.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3			2			1					3		
CO2	4	3	3											3		
CO3	6	2	2	3					1					3		
CO4	6	2	3	3		1			1					3		
CO5	6	2	2	3					1					3		
Average		2.4	2.6	3		1.5			1					3		
Course Correlation Level		3	3	3		2			1					3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: MATERIALS FOR PRESTRESSED CONCRETE AND PRESTRESSING SYSTEMS (08 Periods)

Principles of prestressing, Types of prestressing, Materials - High strength concrete, High tensile steel; Advantages and limitations of pre-stressed concrete, Tensioning devices,

Pretensioning and post-tensioning systems, Types - Hoyer system, Magnel Blaton system, Freyssinet system, Gifford-Udall system, Lee McCall system.

UNIT – II: ANALYSIS OF PRESTRESS (10 Periods)
Analysis of sections for flexure – Stress concept, Load balancing concept, Force concept; Kern zone, Pressure line, Cable zone, Losses of prestress in pre-tensioning and post-tensioning system.

UNIT – III: DESIGN OF SECTION FOR FLEXURE AND SHEAR (08 Periods)
Design of section for the limit state of collapse in flexure, Stress range approach, Design of shear reinforcements – IS codal provision

UNIT - IV: ANALYSIS OF END BLOCKS (10 periods)
Anchorage zone stresses - Guyon's method, Magnel method; Anchorage zone reinforcement, Transfer of prestress pre–tensioned members.

UNIT – V: COMPOSITE CONSTRUCTION OF PRESTRESSED AND INSITU CONCRETE (09 Periods)
Need of composite construction, Different types – Propped, Unpropped; Stress distribution of composite construction, Differential shrinkage, Design of composite section.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:
1. Krishna Raju, N., *Prestressed Concrete*, Tata McGraw–Hill Publications, 6th Edition, 2018.
2. Rajagopalan, N., *Prestressed Concrete*, Narosa Publications, 2nd Edition, 2014.

REFERENCE BOOKS:
1. Ramamrutham, *Prestressed Concrete*, Dhanpat Rai Publications, 5th Edition, 2013.
2. Lin, T. Y., and Ned H. Burns, *Design of Prestressed Concrete Structures*, John Wiley and Sons, 3rd Edition, 2010.
3. Praveen Nagaraju, *Prestressed Concrete Design*, Dorling Kindersley Publication, 2013.
4. Punmia., B. C., Ashok Kumar Jain and Arun Kumar Jain, *Reinforced Concrete Structures*, *Vol. I*, Laxmi Publications Pvt. Ltd., New Delhi, 19th Edition, 2010.

ADDITIONAL LEARNING RESOURCES:
1. Naaman,A. E.,*Prestressed Concrete Analysis and Design*, Mc Graw Hill India, Indian Edition, 2013.
2. Dayaratnam,P., *Prestressed Concrete Structures*, Oxford & Ibh , 2005.
3. Hurst, M. K., *Prestressed Concrete Design,* E & FN Spon,2nd Edition, 2017.

CODE:
IS: 1343–2012 : Prestressed Concrete – Code of Practice

IV B.Tech. – I Semester

(20BT70114) RIVER ENGINEERING AND RIVER BASIN MANAGEMENT

(Professional Elective - 4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course on Fluid Mechanics, Hydrology

COURSE DESCRIPTION: River functions; river hydraulics; river flow mechanism and social aspects; river training works; river basin management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze river systems for solving river engineering problems considering society, environment, and sustainability besides communicating effectively in graphical form.

CO2. Analyze behavior of river hydraulics for solving complex river engineering problems using different techniques considering relevant guidelines, society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze mechanism of river flow for solving complex river engineering problems using different tools and techniques, relevant guidelines, environment and sustainabilitybesides communicating effectively in graphical form.

CO4. Design river training works for solving complex river engineering problems using different tools and techniques considering relevant guidelines, safety, environment and sustainabilitybesides communicating effectively in graphical form.

CO5. Analyzeintegrated river basin management practices for solving complex river basin management problems using different tools and techniques considering latest developments,relevant guidelines, safety, environment and sustainabilitybesides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3				2	1			1					3
CO2	4	2	3		2	2	2	1	1		1					3
CO3	4	2	3		2	2	2	1	1		1					3
CO4	6	1	2	3	2	2	2	1	1		1					3
CO5	4	2	3			2	2	1	1	1	1		1			3
Average		1.80	2.80	3.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00		1.00			3.00
Course Correlation Level		2	3	3	2	2	2	1	1	1	1		1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT - I: RIVER FUNCTIONS (09 Periods)
Rivers – Origin and evolution of river systems, Classification of rivers, Alluvial river channel and flood plainfeatures, Sediment transport, River morphology and various classification schemes.

UNIT - II: RIVER HYDRAULICS (09 Periods)
Behavior of rivers - Introduction, River channel patterns, Straight river channels, Causes;River meandering –Causes, Characteristics, Shapes of meanders and control; Instability of rivers, Hydraulic geometry, Delta formation and control.

UNIT - III: RIVER FLOW MECHANISM AND SOCIAL ASPECTS (09 Periods)
Mechanics of alluvial rivers, Rivers and restoration structures, Socio-cultural influences and ethics ofstream restoration.

UNIT - IV: RIVER TRAINING WORKS (09 Periods)
River training works and river regulation works, Classification, Protection for bridges with reduced waterways, Floodplain management, Waves and tides in estuaries, Interlinking of rivers, River stabilization.

UNIT - V: RIVER BASIN MANAGEMENT (09 Periods)
Basic concepts of River Basin Management (RBM) - Integrated River Basin Management (IRBM), River Basin Organizations (RBOs); Theories and principles of IRBM - Need for IRBM, Irrigation-objectives and benefits of IRBM; Key Activities and Challenges in IRBM - Various Guiding Principles of IRBM, Scenarios in Developed and Developing Countries, Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Garg,S. K., *River Engineering*, Khanna Publishing House, 1st Edition, 2019.
2. Gupta, K. D., *River Engineering,* Vayu Education of India, 1st Edition, 2014.

REFERENCE BOOKS:

1. Janson, PL., Ph., LvanBendegamJvanden Berg, Mdevries A. Zanen (Editors), *Principles of River Engineering – The non tidal alluvial rivers – Pitman*, 1st Edition, 1979.
2. Pierre, Y. J., *River Mechanics*,Cambridge University Press, 2nd Edition, 2018.
3. Bucu, D., *River Basin Management*, INTECH Publication, 2nd Edition, 2017.
4. Brebbia, C.A., *River Basin Management*, Wessex Institute of Technology, UK, 2011.

ADDITIONAL LEARNING RESOURCES:

1. Laurence, S., Keith P., Kevin H., Mary J. P. and David B., *Catchment and River Basin Management*, Routledge Publication, 2017.
2. Xiangzheng, D., and Gibson J., *River Basin Management*, Springer Nature, 2019.

IV B. Tech. – I Semester

(20BT70115) **STRUCTURAL HEALTH MONITORING**

(Professional Elective –4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Courses on Basic Electrical and Electronics Engineering, and Civil Engineering Materials and Concrete Technology.

COURSE DESCRIPTION: Structural Health monitoring; Vibration based techniques for structural health monitoring; Non-Destructive testing of concrete structures;Sensors and it for health monitoring systems; Applications and case studies of SHM in civil infrastructure systems

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyzestructural health monitoring system to solve complex problems using appropriate techniques by following relevant standards considering safety and society besides communicating effectively in graphical form.

CO2. Analyze vibration based techniques for structural health monitoring to solve complex problems using appropriate techniques by following relevant standards considering safety, society and environment besides communicating effectively in graphical form.

CO3. Analyze non destructive testing of concrete structuresto solve complex problems using appropriate tools and techniques by following standards, codes and latest developments by considering safety and environment besides communicating effectively in graphical form.

CO4. Analyze sensors and IT for health monitoring systemsto solve complex problems using appropriate tools and techniques by following relevant standards, codes and latest developments considering safety and environment besides communicating effectively in graphical form.

CO5. Analyze applications and case studies of SHM in civil infrastructure systems to solve complex problems using appropriate tools and techniques by following relevant standards, codes and latest developments considering safety, society and environment, besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	2		1	2	1				2			3		
CO2	4	2	2		2	2	1				2			3		
CO3	4	3	2	3	2	3	1	1	2		1		1	3		
CO4	4	3	2	3	1	3	1	1			1		2	3		
CO5	4	1	2	3	2	2	1	1	2		1		2	3		
Average		2.4	2	3	1.6	2.4	1	1	2		1.4		1.66	3		
Course Correlation Level		3	2	3	2	3	1	1	1		2		2	3		

Correlation Levels: H: High M: Medium L: Low

DETAILED SYLLABUS:

UNIT - I: STRUCTURAL HEALTH MONITORING (09 periods)

Need for SHM, SHM - A way for smart materials and structures, SHM and biomimetic analog between the nervous system of a man and a structure with SHM, SHM as a part of system management, Passive and active SHM, NDE, SHM and NDECS, Basic components of SHM, Materials for sensor design.

UNIT – II: VIBRATION BASED TECHNIQUES FOR STRUCTURAL HEALTH MONITORING (09 Periods)

Introduction, Basic vibration concept for SHM, Mathematical description for structural system with damage, Linking experimental and analytical data, Damage localization and quantification, Neural network approach to SHM, Connectionist algorithms for anomaly detection, time domain damage detection methods for linear system, damage identification in non-linear system and application.

UNIT - III:NONDESTRUCTIVE TESTING OF CONCRETE STRUCTURES (09 periods)

Situations and contexts, Need, Classification of NDT procedures, Visual inspection, Half-Cell electrical potential methods, Schmidt rebound hammer test, Resistivity measurement, Electrical resistance, Electromagnetic methods, Radiographic testing, Ultrasonic testing, Infrared thermography, Ground penetrating radar, Radio isotope gauges, Other methods.

UNIT - IV:SENSORS AND IT FOR HEALTH MONITORING SYSTEMS (09 periods)

Sensors for SHM:Acoustic emission sensors, Ultrasonic sensors, Piezoelectric sensors and actuators, Fibreoptic sensors and Laser shearography techniques, Imaging techniques.

Information Technology for Health Monitoring: Information gathering, Signal analysis, Information storage, Archival, Retrieval, Security, Wireless communication, Telemetry, Real time remote monitoring, Network protocols, Data analysis and interpretation.

UNIT - V: APPLICATIONS AND CASE STUDIES OF SHM IN CIVIL INFRASTRUCTURE SYSTEMS (09 Periods)

Capacitance probe for concrete cover, Applications for external post tensioned cables, Structural health monitoring of bridges, Structural health monitoring of cable – supported bridges, structural health monitoring of historical buildings.

Total Periods: 45

Topics for self-study are provided in lesson plan

TEXT BOOKS:

1. Daniel Balageas, Claus-Peter Fritzen and Alfredo Guemes, *Structural Health Monitoring*, ISTE Ltd., U.K. 2006.
2. Vistasp M. Karbhari and Farhad Ansari, *Structural Health Monitoring of Civil Infrastructure System*, Wood Head Publishing Limited, Cambridge, 2009.

REFERENCE BOOKS:

1. Wang, M. L., Lynch, L. P., and Sohn, H., *Sensors Technologies for Civil Infrastructure*, *Vol.1 & 2*, Wood Head Publishing Limited, Cambridge, 2009.
2. Philip, W., *Industrial Sensors and Applications for Condition Monitoring*, MEP, 1994.
3. Prasad, J. and Nair,C. G. K., *Non-destructive Test and Evaluation Materials*, McGraw Hill, 2nd Edition, 2011.
4. Poonam, Modi, I., and Chirag N. Patel, *Repair and Rehabilitation of Concrete Structures,*Prentice-Hall of India Pvt. Ltd., New Delhi, 2016.

ADDITIONAL LEARNING RESOURCES:

1. Victor Giurgiutiu, *Structural Health Monitoring with Piezoelectric Wafer Active Sensors*, Academic Press, 2010.
2. Charles R. Farrar, *Structural Health Monitoring*, John Wiley & Sons, 2012

CODES

IS 13311 – 1992 (Part1) : *Non-Destructive testing of concrete – Methods of test*, January, New Delhi.

IV B.Tech. – I Semester

(20BT70116) ANALYSIS AND DESIGN OF COMPOSITE STRUCTURES

(Professional Elective-5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: - Courses on Structural Analysis, Reinforced Cement Concrete Structures, Steel Structures.

COURSE DESCRIPTION: Steel-concrete composite construction; Design of composite members; Design of shear connectors; Design of composite box girder bridges; Case studies and seismic behavior of composite structures.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze steel-concrete composite construction to solve composite structures using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.

CO2. Design composite members to solve complex problems using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.

CO3. Design the shear connectors to solve complex problems using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.

CO4. Design composite box girder bridges to solve complex problems using appropriate techniques considering safety, serviceability and code of practice besides communicating effectively in graphical form.

CO5. Analyze the seismic behavior of composite structures to solve complex problems using appropriate techniques considering safety, society, environment and code of practice.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3			2	1		1		1			3		
CO2	6	2	2	3	3	2	1		1		1			3		
CO3	6	2	2	3	3	2	1		1		1			3		
CO4	6	2	2	3	3	2	1		1		1			3		
CO5	4	3	3			2	2	1	1					3		
Average		2.40	2.40	3	3	2	1.20	1	1		1			3		
Course Correlation Level		3	3	3	3	2	2	1	1		1			3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: STEEL-CONCRETE COMPOSITE CONSTRUCTION (09 Periods)
Introduction to steel-concrete composite construction, Codes, Composite action, Serviceability and construction issues in design.

UNIT – II: DESIGN OF COMPOSITE MEMBERS (09 Periods)
Design of composite beams, slabs, columns and beam–columns; Design of composite trusses.

UNIT–III: DESIGN OF SHEAR CONNECTORS (09 Periods)
Shear connectors, Types, Design of connections in composite structures, Design of shear connectors, Partial shear interaction.

UNIT – IV: DESIGN OF COMPOSITE BOX GIRDER BRIDGES (09 Periods)
Introduction, Behavior of box girder bridges, Design of composite box girder bridges.

UNIT – V: CASE STUDIES AND SEISMIC BEHAVIOR OF COMPOSITE STRUCTURES (09 Periods)
Case studies on steel-concrete composite construction in buildings, seismic behavior of composite structures.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:
1. Johnson R.P., *Composite Structures of Steel and Concrete Beams, Slabs, Columns and Frames for Buildings- Vol.I*, Blackwell Scientific Publications, 2004.
2. Oehlers D.J. and Bradford M.A., *Composite Steel and Concrete Structural Members*: *Fundamental Behaviour*, Pergamon Press, 1st Edition 2013.

REFERENCE BOOKS:
1. Qing Quan Liang, *Analysis and Design of Steel and Composite Structures*, CRC Press, 1st Edition, 2015.
2. Owens, G.W. and Knowles, P., *Steel Designers Manual*, Steel Concrete Institute(UK), Oxford Blackwell Scientific Publications, 1992.
3. Narayanan, R., *Steel-Concrete Composite Structures*, CRC Press, 1st Edition, 1988.
4. Manoj Kumar Buragohain, *Composite Structures: Design, Mechanics, Analysis, Manufacturing, and Testing*, CRC Press, 1st Edition, 2017.

ADDITIONAL LEARNING RESOURCES:
1. Ever J. Barbero, *Introduction to Composite Materials Design*, CRC Press, 3rd Edition, 2017.

IS Codes:

IS: 3935 - 1966 : Code of Practice for Composite Construction.

IS: 11384 – 1985 : Code of Practice for Composite Construction in Structural Steel and Concrete.

IV B. Tech. – I Semester

(20BT70117) **BRIDGE ENGINEERING**

(Professional Elective - 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Engineering Mechanics, Mechanics of Solids, Structural Analysis, Reinforced Concrete Structures, Transportation Engineering, Engineering Hydrologyand Foundation Engineering

COURSE DESCRIPTION: Bridge loading standards; Deck slab bridge; Box culvert; Beam and slab bridge; Bridge bearings; Piers and abutments**.**

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze bridge loading standards to solve bridge engineering problems following relevant codes ensuring safety besides communicating effectively in graphical form.

CO2. Design deck slab bridge and box culvert to solve complex bridge engineering problems using appropriate techniques considering safety, serviceability, environment and IRC codes of practice besides communicating effectively in graphical form.

CO3. Design beam and slab bridge to solve complex bridge engineering problems using appropriate techniques considering safety, serviceability, environment and IRC codes of practice besides communicating effectively in graphical form.

CO4. Design bridge bearings to solve complex bridge engineering problems using appropriate techniques considering safety, serviceability, environment and IRC codes of practice besides communicating effectively in graphical form.

CO5. Analyze piers, abutments and bridge foundations to solve bridge engineering problems considering safety,serviceability, environment and IRC codes of practice.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	2				2		1		1			3		
CO2	6	1	2	3	3	2	1	1	1		1			3		
CO3	6	1	2	3	3	2	1	1	1		1			3		
CO4	6	1	2	3	3	2	1	1	1		1			3		
CO5	4	2	3				1	1	1					3		
Average		1.6	2.2	3	3	2	1.2	1	1		1			3		
Course Correlation Level		2	3	3	3	2	2	1	1		1			3		

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: BRIDGE LOADING STANDARDS (09 Periods)
Importance of site investigation in bridge design, Various loads in bridges, Highway bridge loading standards, Impact factor, Railway bridge loading standards.

UNIT – II: DECK SLAB BRIDGEAND BOX CULVERT (09 Periods)
Deck Slab Bridge: Effective width method of analysis and design of deck slab bridge (simply supported) subjected to Class AA tracked vehicle only.
Box Culvert: General aspects, Design loads, Design of box culvert subjected to class AA tracked vehicle only.

UNIT – III: BEAM AND SLAB BRIDGE (T–BEAM BRIDGE) (09 Periods)
General features, Design of interior panel of slab, Pigeauds method, Design of a T–beam bridge subjected to Class AA tracked vehicle only.

UNIT - IV: BRIDGE BEARINGS (09 periods)
General features, Types of bearings, Design principles of steel rocker and roller bearings, Design of a steel rocker bearing, Design of elastometric pad bearing.

UNIT – V: PIERS AND ABUTMENTS (09 Periods)
General features, Bed block, Materials of piers and abutments, Types of piers, Forces acting on piers, Stability analysis of piers, General features of abutments, Forces acting on abutments, Stability analysis of abutments, Types of wing walls, Approaches, Types of bridge foundations (excluding design).

Total Periods: *45*

Topics for self-study are provided in the lesson plan

TEXT BOOKS:

1. KrishnaRaju, N., *Design of Bridges*, CBS Publishers and Distributors Pvt Ltd, 5th Edition,2019.
2. Ponnuswamy, S., *Bridge Engineering,* Tata Mcgraw–Hill Company, 3rd Edition, 2017.

REFERENCE BOOKS:

1. Jagadish, T. R. andJayaram, M. A., *Design of BridgesStructures*,Prentice Hall of India Pvt. Ltd.,2nd Edition, 2009.
2. Bindra, S. P., *Principles and Practice of Bridge Engineering*, Dhanpat Rai PublishingCo Pvt Ltd, 2012.
3. Victor D. Johnson, *Essentials of Bridge Engineering,*Oxford & IBH Publishing Co Pvt.Ltd., 6th Edition, 2019.
4. Rangwala, *Bridge Engineering*, Charotar Publishing House Pvt. Ltd, 16th Edition, 2015.

ADDITIONAL LEARNING RESOURCES:

1. Aswani, M. G., Vazirani, V. N. and Ratwani, M. M., *Design of Concrete Bridges,* Khanna Publishers, 1995.
2. Krishna Raju, N., *Prestressed Concrete Bridges*, CBS Publishers, 1st Edition, 2016.

Codes:

IRC: 6:2017	: Loads and Load Combinations.
IRC: 112-2011	: Concrete Road Bridges.
IRC: 83(Part I):1999	: Bearings, Part I: Metallic Bearings.
IRC: 83(Part II):1987	: Bearings, Part II: Elastomeric Bearings.

IV B.Tech. - I Semester

(20BT70118) CIVIL INFRASTRUCTURE FOR SMART CITY DEVELOPMENT

(Professional Elective – 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: -

COURSE DESCRIPTION: Smart cities;Urban planning for smart city;Smart city development; Smart buildings; Smart city mobility;Smart city utilities and services.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze various elements of smart city infrastructure to solve complex problems following relevant policies considering health, safety, society, environment, sustainability and project management.

CO2. Analyze urban planning to solve complex smart city problems following relevant standards by using appropriate tools and techniques considering society, environment and sustainability besides communicating effectively in graphical form.

CO3. Analyze smart city development and smart buildingsto solve complex problems using appropriate tools and techniquesfollowingrelevant standards considering health, safety, environment, sustainability, economics and management.

CO4. Analyze smart city mobility to solve complex smart cityproblems using appropriate tools and techniquesfollowing relevant policies consideringsafety, society, environment and sustainability.

CO5. Analyze smart city utilities and services to solve complex smart city problems using appropriate tools and techniques considering health, society, environment, sustainability, economics and management.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		2		2	2	1					3		
CO2	4	3	3		2	2	1	1	1		1			3		
CO3	4	3	3		2	2	1	1	1			1		3		
CO4	4	3	3		3	2	1	1	1					3		
CO5	4	3	3		2	2	1	1				1		3		
Average		3	3		2.20	2	1.20	1.20	1		1	1		3		
Course Correlation Level		3	3		3	2	2	2	1		1	1		3		

Correlation Levels: 3:H – High 2:M – Medium 1:L – Low

DETAILED SYLLABUS:

UNIT – I:SMART CITIES (08 Periods)

Smart City;Elements of Smart city infrastructure – Buildings, Mobility, Energy, Water, Waste management, Health and Digital layers;Need for an integrated approach;Role of science, technology and innovation in the implementation of smart infrastructure; Smart infrastructure design principles and policies;Case studies: Gujarat International Finance Tech-City in India.

UNIT – II: URBAN PLANNING FOR SMART CITY (09 Periods)

Introduction to concepts of urban planning; Various levels – Development Plan, Regional Plan, Sub-city Plans; Provision of local needs; Importance of local area and neighborhood planning; Land use controls and zoning; Housing and slum rehabilitation; Urban patterns; Conservation of Natural and built heritage environment; Elements of urban design; Indian best practices in urban planning; Application of Remote Sensing(RS) for land use/land cover, agriculture and urban planning.

UNIT – III:SMART CITY DEVELOPMENT AND SMART BUILDINGS (10 Periods)

Smart City Development: Evolution and Concept; Objectives; Contemporary features; Relevance and Importance; Barriers and Drivers;Smart City Governance and Public Institutions; Sustainability and Resilience; Livability index; Smart city ranking index; Application of BIM in Smart city development.

Smart Buildings: Smart building; Siting the building; Materials; Measuring thePerformance of aBuilding – Financial metrics, Security and life safety, Productivity and satisfaction of building occupants; Essential attributes of a smart building – HVAC, Lighting control, Electric power management, Access control, Video surveillance, Fire alarmand mass notification; Design,Construction,and Renovation process; The Economics of smart buildings; Energy and sustainability; Case studies.

UNIT – IV:SMART CITY MOBILITY (09 Periods)

Introduction; Issues of urban transport; Demand and supply side solutions; Design concepts (pedestrian friendly/vehicle friendly design, safety considerations); Sustainable transportation; Urban transport planning process;Traffic operation policies; Intelligent Transportation System (ITS) for efficient utilization of resources;Components of ITS; Public transportation systems - Metro rail and Bus Rapid Transit System (BRTS); New trends in urban mobility; Case studies.

UNIT – V:SMART CITY UTILITIES AND SERVICES (09 Periods)

Sector wise issues in city infrastructure services such as water distribution; waste water collection; waste treatment; Tariff structures; Metering and billing; 24x7 water supply system; Urban sanitation; Integrated Water Resource Management System (IWRM); Smart city applications using RS &Geographic Information System(GIS)for water and waste water utilities; Street lighting system; Case studies.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. James Sinopoli, *Advanced Technology for Smart Buildings*, Artech House, 2016.
2. Sussman, J.S., *Perspectives on Intelligent Transportation Systems (ITS),* Springer Science & Business Media, 2008.

REFERENCE BOOKS:

1. Geertman, S., Ferreira, J., Goodspeed, R. & Stillwell, J., *Planning Support Systems and Smart Cities*, Springer, 2015.
2. Vinodkumar, T.M., *Geographic Information System for Smart Cities*, Copal Publishing, 2014.

3. James M. Sinopoli, *Smart Buildings Systems for Architects, Owners and Builders*, Butterworth-Heinemann, 1st Edition, 2009.
4. Jha, R., Chandiramani, J., *Perspectives in Urban Development-Issues in Infrastructure, Planning and Governance*, Capital Publishing, New Delhi, 1st Edition, 2012.

ADDITIONAL LEARNING RESOURCES:

1. Khisty, C.J. and Lall, B.K., *Transportation Engineering*, Pearson Education India, 3rd Edition, 2017.
2. *Smart Cities Mission Statement & Guidelines*, Ministry of Urban Development Government of India, June 2015.
3. *Smart Cities and Infrastructure,* Commission on Science and Technology for Development, Nineteenth Session, United Nations Conference on Trade and Development, 09 - 13 May 2016, Room XVIII, Palais des Nations, Geneva, Switzerland.

IV B.Tech. - I Semester

(20BT70119) ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

(Professional Elective – 5)

Int. Marks	Ext. Marks	Total	L	T	P	C
30	70	100	3	–	–	3

PREREQUISITES: Courses onEnvironmental Science, Environmental Engineering.

COURSE DESCRIPTION: Environmental Impact Assessment; EIA methodologies; EIA on soil, groundwater and surface water;EIA on air, vegetation and wild life; Environmental acts and management system.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze the environmental impact assessment to provide solutions to environmental problems using appropriate tools and techniques following relevant standards and regulations considering the society, health, safety, environment, sustainability and economics besides communicating effectively in graphical form.

CO2. Analyze EIA methodologies to solve environmental problems following relevant standards, regulations and latest developments considering the society, health, safety, environment, sustainability and economics besides communicating effectively in graphical form.

CO3. Analyze EIA on soil, groundwater and surface water to provide solutions to environmental problems using appropriate tools and techniques following relevant standards and regulations considering the society, health, safety, environment, sustainability and project management besides communicating effectively in graphical form.

CO4. Analyze EIA on air, vegetation and wildlife to provide solutions to environmental problems using appropriate tools and techniques following relevant standards and regulations considering the society, health, safety, environment, sustainability and project management besides communicating effectively in graphical form.

CO5. Analyze environmental acts and management system to solve complex environmental problems using appropriate tools and techniques following relevant standards, regulations and latest developments considering the society, health, safety, environment, sustainability and project management besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3			2	3	3	1		2	2				3
CO2	4	2	3			2	3	3	1		2	2	1			3
CO3	4	2	3			2	3	3	1		2	2				3
CO4	4	2	3			2	3	3	1		2	2				3
CO5	4	2	3		2	2	3	3	2	2	2	2	1			3
Average		2	3		2	2	3	3	1.2	2	2	2	1			3
Course Correlation Level		2	3		2	2	3	3	2	2	2	2	1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: ENVIRONMENTAL IMPACT ASSESSMENT (09 Periods)
Basic concept of EIA,Introduction to life cycle analysis, Initial environmental examination, Elements of EIA, Factors affecting EIA,Impact evaluation and analysis, Preparation of environmental base map andclassification of environmental parameters.

UNIT – II: EIA METHODOLOGIES (08 Periods)
Criteria for the selection of EIA Methodology; EIA Methods – Adhoc method, Matrix method, Network method, Environmental medium quality index method, Overlay method and Cost/benefit analysis, Latest developments.

UNIT – III: EIA ON SOIL, GROUNDWATER AND SURFACE WATER (10 Periods)
Soil and water quality,Impact assessment on soil – Delineation of study area, Identification of activities, Impact prediction, Assessment of impact significance, Identification and incorporation of mitigation measures; EIA on surface and ground water - Methodology for the assessment of impacts on water environment, Identification and incorporation of mitigation measures, Watershed management.

UNIT – IV: EIA ON AIR, VEGETATION AND WILDLIFE (09 Periods)
Air pollution sources, generalized approach for assessment of impact due to air pollution caused by the various anthropogenic activities,Identification and incorporation of mitigation measures;Assessment of impact on vegetation and wildlife caused by the various developmental activities; Environmental impact due to deforestation – Causes and effects; Case studies.

UNIT – V: ENVIRONMENTAL ACTS AND MANAGEMENT SYSTEM (09 Periods)
Environmental Acts - Environmental protection act, The water act, The air act, Wild life act; Environmental management system– Objectives, Environmental audit, Types and Stages of environmental audit, Evaluation of audit data and preparation of audit report, Post audit activities, case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Anjaneyulu, Y.,*Environmental Impact Assessment Methodologies,* B.S. Publications,2nd Edition, 2007.
2. Khandeshwar, S.R., Raman, N.S., Gajbhiye, A.R., *Environmental Impact Assessment*, Wiley Publications, Wiley India Pvt. Ltd., Noida, 2019.

REFERENCE BOOKS:

1. Marriott, B.,*Environmental Impact Assessment: A Practical Guide*, McGraw-Hill, New York, USA. 1997.
2. CharlessH.Eccleston, *Environmental Impact Assessment*, CRC Press, Taylor and Francis Group, 2011.
3. Suresh K. Dhameja, *Environmental Engineering and Management*, S.K. Kataria and Sons, 2010.
4. Bhatia, H. S., *A Text Book of Environmental Pollution and Control*, Galgotia Publications (P) Ltd., 2003.

ADDITIONAL LEARNING RESOURCES:

1. Peavy, H.S., ROWE, D.R., Tchobanoglous, G., *Environmental Engineering*, McGraw-Hill Book Co., New Delhi, 1995.
2. John Glasson, Riki Therivel and Andrew Chadwick, *Introduction to Environmental Impact Assessment*, 3rdEdition, Routledge, London and New York, 2012.

3. Santosh Kumar Garg, *Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, New Delhi, 27thEdition, 1stReprint, 2013.
4. *Manual on Water Supply and Treatment*, CPHEEO, Government of India, New Delhi, 1999.
5. *Manual on Sewerage and Sewage Treatment*, CPHEEO, Govt. of India, New Delhi, 1993.

IV B. Tech. – I Semester

(20BT70120) **GEOTECHNICS FOR UNDERGROUND STRUCTURES**
(Professional Elective **-** 5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: - Courses on Soil Mechanics, Foundation Engineering.

COURSE DESCRIPTION: Underground structures and geotechnical investigations; Underground space planning and design;Failure criteria for soil and rock;Analysis and design of underground structures; Non-destructive testing and health monitoring.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze underground structures and geotechnical investigationsto solve complex problems associated with underground structures using appropriate tools and techniques by following the relevant codes of practice and latest developments considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.

CO2. Design underground space and planning to solve complex problems associated with underground structures using appropriate techniques by following the relevant codes of practice considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.

CO3. Analyze the failure criteria for soil and rock to solve complex problems associated with underground structures using appropriate techniques considering safety besides communicating effectively in graphical form.

CO4. Design underground structuresto solve complex problems associated with underground structures using appropriate techniques by following the relevant codes of practice considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.

CO5. Analyze non–destructive testing and health monitoring of underground structures using appropriate techniques to solve complex problems by following the relevant codes of practice and latest developments considering safety, society, environment, sustainability and project management besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		2	3	1	1	2		1	1	1		3	
CO2	6	2	2	3	2	2	1	1	1		1	1			3	
C03	4	2	3		2	2	1	1	1		1				3	
CO4	6	2	2	3	2	2	1	1	1		1	1			3	
CO5	4	2	3		2	3	1	1	2		1	1	1		3	
Average		2	2.6	3	2	2.4	1	1	1.4		1	1	1		3	
Course Correlation Level		2	3	3	2	3	1	1	2		1	1	1		3	

Correlation Levels: 3: H - High 2: M - Medium 1: L – Low

DETAILED SYLLABUS:

UNIT - I: UNDERGROUND STRUCTURES AND GEOTECHNICAL INVESTIGATIONS (09 Periods)

Underground structures - Introduction, Necessity for underground construction, Types and applications of underground structures, Parameters for site selection, Laboratory and field tests of soil, Materials used in underground structures, Geoengineering; Investigations for rock or rock mass characterization - Topographical and geological survey, augering, drilling, soil and rock sampling and testing, Preparing subsurface geological cross section, Georadar use and data analysis for shallow tunnels, Geophysical investigations to identify deeper sub-surface features, Characterization of ground profile.

UNIT – II: UNDERGROUND SPACE PLANNING AND DESIGN (09 Periods)

Determination of appropriate location, size, shape and alignment; Assessment of behaviour of tunnelling media - Deformation modulus and support pressure measurement, Application of numerical modelling in space design, Earthquake effects on tunnels, Design of underground space in rocks with the help of field data; Design of underground openings - Design based on empirical methods such as RSR, RMR, Q systems, Design based on Rock support interaction analysis; Observational methods - NATM, Convergence-confinement method, Key block analysis; Stability of excavation face and tunnel portals.

UNIT – III: FAILURE CRITERIA FOR SOIL AND ROCK (09 Periods)

Failure theories - Failure criteria for soil and rock masses, Mohr-Coulomb yield criterion, Hoek-Brown criterion, Tensile yield criterion, Jointed rock yield criterion, Hardening soil criterion, Strength of discontinuities.

UNIT – IV: ANALYSIS AND DESIGN OF UNDERGROUND STRUCTURES (09 Periods)

Beam on elastic foundation method, Stress based analysis, Deformation-based analysis, Soil–structure interaction, Analysis of geotechnical structures using Boundary element method, finite element method, Rankine's and Coulomb's earth pressure theory, Earth pressure for design of excavation, Design of box culvert structures, Design of foundation pit retaining walls.

UNIT – V: NON-DESTRUCTIVE TESTING AND HEALTH MONITORING (09 Periods)

Strain integrity testing, Cross hole sonic tests,Health monitoring of underground structures, Use of sensors,Vibrating wire displacement sensor, Potentiometric displacement sensor, inclinometer/in place-inclinometer, Wireless tilt meter, Data loggers – Measurement and interpretation of test data.

Total Periods: *45*

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Zhen-Dong Cui, Zhong-Liang Zhang, Li Yuan, Zhi-Xiang Zhan and Wan-Kai Zhang, *Design of Underground Structures,* Springer, 2020.
2. Pietro Lunardi, *Design and Construction of Tunnels,* Springer, 2008.

REFERENCE BOOKS:

1. Sinha,R.S., *Underground Structures: Design and Instrumentation*, Elsevier Science Publisher, 1989.
2. Bai Yun., *Underground Engineering: Planning, Design, Construction and Operation of the Underground Space*, Academic Press, 2019.
3. Goel, R.K., Singh, B., Zhao, J., *Underground Infrastructures: Planning, Design and Construction*, Elsevier, 2012.

ADDITIONAL LEARNING RESOURCES:

1. John A Hudson and John P Harrison, *Engineering Rock Mechanics: An Introduction to the Principles,* Elsevier Science and Technology, 2000.
2. Richard E. Goodman, *Introduction to Rock Mechanics*, John Wiley and Sons, 2nd Edition, 1989.
3. Bieniawski,Z.T.,*Rock Mechanics Design in Mining and Tunneling,* A.A. Balkema, 1984.
4. Obert,L. and Duvall,W.I.,*Rock Mechanics and the Design of Structures in Rock,* Wiley, 1967.
5. Bieniawski,Z.T.,*Engineering Rock Mass Classifications: A Complete Manual for Engineers and Geologists in Mining, Civil, and Petroleum Engineering,* Wiley, 1989.
6. Sherif, A., Piergiorgio, G., *Engineering Challenges for Sustainable Underground Use*, Proceedings of the 1stGeoMEast International Congress and Exhibition, Egypt, 2017.

IV B. Tech. – I Semester

(20BT70121) **TRAFFIC ENGINEERING AND MANAGEMENT**

(Professional Elective-5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

PRE-REQUISITES: Course one Transportation Engineering**.**

COURSE DESCRIPTION: Traffic engineering;Traffic characteristics;Traffic studies;Parking studies;Highway capacity;Highway safety;Traffic signs and road markings;Traffic and environment;Traffic control, regulation and Traffic management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyzetraffic and traffic characteristics to solve complex traffic engineering problems using appropriate techniques following relevant codes considering society and environment besides communicating effectively in graphical form.

CO2. Analyzetraffic measurements to solve complex traffic engineering problems using appropriate techniques following relevant codes considering society and environment besides communicating effectively in graphical form.

CO3. Analyzehighway capacity and safety to solve complex traffic engineering problems using appropriate techniques following relevant codes considering environment besides communicating effectively in graphical form.

CO4. Analyzetraffic signs, road markings; traffic and environment to solve complex traffic engineering problems using appropriate techniques following relevant standards considering safety besides communicating effectively in graphical form.

CO5. Analyze traffic control, regulation and management to solve complex traffic engineering problems using appropriate techniques following relevant standards and latest developments considering society and environment besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		1	1	1	1	1		1				3	
CO2	4	2	3		1	1	1	1	1		1				3	
CO3	4	3	3		1	1	2	1	1		1				3	
CO4	4	2	3		1	1	2	1	1		2				3	
CO5	4	2	3		1	1	1	1	1		1	1	1		3	
Average		2.40	3.00		1.00	1.00	1.40	1.00	1.00		1.200	1.00	1.00		3.00	
Course CorrelationLevel		3	3		1	1	2	1	1		2	1	1		3	

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYLLABUS:

UNIT – I: TRAFFIC ENGINEERING AND TRAFFIC CHARACTERISTICS (9 Periods)

Traffic Engineering:Significance and scope; Characteristics of vehicles and road users; Skid resistanceand braking efficiency (Problems); Components of traffic engineering - Road, traffic and land use characteristics.

Traffic Characteristics:Basic characteristics of traffic - volume, speed and density; Relationship among traffic parameters; Temporal headway and spatial headway; Vehicular speed trajectories; Car-following and lane change theories - Macroscopic flow models, Microscopic flow models; Shockwave analysis with examples.

UNIT-II: TRAFFIC MEASUREMENTS (9 Periods)

Traffic Studies:Traffic volume studies - Objectives, Types of volume studies, Concept of PCU, Data collection andpresentation; Speed studies - Types of speeds, Objectives ofspeed studies, Methods of conducting speed studies, Data collectionand presentation, Statistical methods for analysis of speed data; Origin and destination studies, Pedestrian studies, Basic principlesof traffic flow.

Parking Studies:Types of parking facilities, On-street and off-street parking facilities, Parking inventory study, Parking survey by patrolling method, Analysis of parking dataand parking characteristics, Multi storey car parking facility, Design standards.

UNIT-III: HIGHWAY CAPACITY AND SAFETY (9 Periods)

Highway Capacity: Definition of capacity, Importance ofcapacity, Factors affecting capacity, Concept of level of service, Different levels of service, Concept of service volume, Peak hourfactor.

Highway Safety: Problem of highway safety, Types of roadaccidents, Causes, Engineering measures to reduce accidents, Enforcement measures, Educational measures, Road safety audit, Principles of road safety audit.

UNIT-IV: TRAFFIC SIGNS, ROAD MARKINGS, TRAFFIC AND ENVIRONMENT (9 Periods)

Traffic Signs and Road Markings: Types of traffic signs; Cautionary, regulatory and informative signs; Specifications, Pavement markings, Types of markings, Lane markings and objectmarkings, Standards and specifications for road markings.

Traffic and Environment: Detrimental effect of traffic onenvironment, Air pollution, Pollutants due to traffic, Measures toreduce air pollution due to traffic, Noise pollution, Measures toreduce noise pollution.

UNIT-V: TRAFFIC CONTROL, REGULATION AND MANAGEMENT (9 Periods)

Traffic Control and Regulation: Traffic problems in urbanareas, Importance of traffic control and regulation, Traffic regulatorymeasures, Channelization; Principle and design of intersections,grade separations and interchanges; Traffic signals, Saturationflow, Design of traffic signals and signal co-ordination (Problems), Signal phasing and timing diagrams, Traffic control aids and street furniture, Street lighting, Computer applications in signal design.

Traffic Management: Transportationsystem management (TSM), Travel demand management (TDM), Traffic forecasting techniques, restrictions on turning movements, One-way Streets, Traffic segregation, Traffic calming, Tidal flowoperations, Exclusive bus lanes, Introduction to intelligenttransportation system (ITS).

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi, 9th Edition, 1999.
2. Khanna, K. and Justo, C. E. G., *Highway Engineering,* Nem Chand & Bros, 8th Edition*,* 2009.

REFERENCE BOOKS:

1. Roger Roess, P. Elena, S. Prassas and William, R. Shane, M. C., *Traffic Engineering*, Prentice Hall, 4th Edition, 2010.
2. Chakroborthy, P. and Das, A., *Principles of Transportation Engineering*, Prentice Hall of India Pvt. Ltd, 2nd Edition, 2017.
3. Subhash, C. and Saxena, A.,*Course in Traffic Planning and Design*, DhanpatRai Publications, 2010.
4. JotinKhisty, C. and KentLall, B., *Transportation Engineering – An Introduction*, Prentice Hall of India Pvt. Ltd., 3rd Edition, 2002.

ADDITIONAL LEARNING RESOURCES:

1. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning*, PearsonIN, 3rd Edition, 2015.
2. Fred L Mannering and Scott S Washburn, *Principles ofHighway Engineering and Traffic Analysis*, Wiley, 7th Edition, 2019.
3. Indian Roads Congress (IRC) Specifications: *Guidelines and Special Publications on Traffic Planning and Management*.
4. *Guidelines of Ministry of Road Transport and Highways*, Government of India.

IV B.Tech. – I Semester

(20BT70122) WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT

(Professional Elective–5)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	–	–	3

PREREQUISITES: Courses on Surveying, Engineering Hydrology, Irrigation Engineering.

COURSE DESCRIPTION: Concepts of Water resources systems; Linear programming; Dynamic programming; Non–linear optimization techniques andsimulation; Water resources economics and management.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze systems approach to water resources to solve complex water resources engineering problemsusing appropriate tools and techniques considering society, environment, sustainability and project management.

CO2. Formulatelinear programming modelsto solve complex water resources engineering problemsusing appropriate tools and techniques considering society, environment, sustainability and project management.

CO3. Formulatedynamic programming modelsto solve complex water resources engineering problemsusing appropriate tools and techniques considering society, environment, sustainability and project management.

CO4. Analyze non–linear optimization and simulation techniquesin water resources planningto solve complex water resources engineering problems considering society, environment and sustainability.

CO5. Analyze various water resources economics to solve complex water resources engineering problems for sustainable water resources planning and management following ethics considering society, environment and management.

Mapping of COs with POs and PSOs

Course Outcomes	Blooms Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		1	1	1	1								3
CO2	4	2	3		1	1	1	1								3
CO3	4	2	3		1	1	1	1								3
CO4	4	2	3		1	1	1	1								3
CO5	4	2	3		1	1	1	1	1			1				3
Average		2	3		1	1	1	1	1			1				3
Course Correlation Level		2	3		1	1	1	1	1			1				3

Correlation Levels: 3: H – High 2: M – Medium 1: L - Low

DETAILED SYALABUS:

UNIT - I: WATER RESOURCE SYSTEMS (09 Periods)
Concepts of systems analysis, Systems approach to water resources planning and management, Role of optimization models, Objective function and constraints, Types of optimization techniques.

UNIT - II: LINEAR PROGRAMMING (09 Periods)
Formulation of linear programming models, Graphical method, Simplex method, Application of linear programming in water resources, Revised simplex method, Duality in linear programming, Sensitivity and post optimality analysis.

UNIT - III: DYNAMIC PROGRAMMING (09 Periods)
Belman's principles of optimality, Forward and backward recursive dynamic programming, Case of dimensionality, Application of dynamic programming for resource allocation.

UNIT - IV: NON–LINEAR OPTIMIZATION TECHNIQUES AND SIMULATION (08 Periods)
Classical method of optimization, Kun–Tucker, Gradient based techniques for simple unconstrained optimization, Application of simulation techniques in water resources planning.

UNIT - V: WATER RESOURCES ECONOMICS AND MANAGEMENT (10 Periods)
Principles of economic analysis,Benefit cost analysis, Socio–economic institutional and pricing of water resources, Planning of reservoir system,Optimal operation of single reservoir system, Allocation of water resources,Optimal cropping pattern,Conjunctive use of surface and sub–surface water resources, Case studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan.

TEXT BOOKS:

1. Vedula, S., and Mujumdar,P. P.,*Water Resources Systems*, Tata McGraw–Hill, 5th Edition, 2010.
2. Ramanathan,N.,*Operations Research*, TMH Publications, 2005.

REFERENCE BOOKS:

1. Bhave,P. R.,*Optimal Design of Water Distribution Networks*, Narosa Publishing House, 2003.
2. Sankar Iyer,P.,*Operations Research*, TMH Publications, 2008.
3. Rao, S. S.,*Engineering Optimization,* John Wiley and Sons Inc., 4th Edition, 2009.
4. James and Lee, *Water Resources Economics,* Oxford Publishers, 2005.
5. Jain, S. K., and Singh, V. P., *Water Resources Systems Planning and Management*, Elsevier, Netherlands, 2003.

ADDITIONAL LEARNING RESOURCES:

1. Loucks, D. P., and Beek, E. V., *Water Resources Systems Planning and Management*, UNESCO Publishing, Netherland, 2005.
2. Chadurvedi, M. C., *Water Resource Systems Planning and Management*, Tata McGrawHill inc., New Delhi, 1997.

IV B.Tech. – I Semester

(20BT70131)**COMPUTER AIDED DESIGN AND DETAILING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Courses on Structural Analysis, Reinforced Cement Concrete Structures, Steel Structures, Advanced RCC, Advanced Steel Structures.

COURSE DESCRIPTION: Exercises on Analysis and design of Simple beams; 2–D and 3–D RCC Frames; Trusses; Solid slabs; Retaining walls; Water tanks; Plate Girder Bridges.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Design RCC structures and structural elements to solve complex structural engineering problems using appropriate software tools and techniques following relevant IS Codes considering safety and serviceability.

CO2. Design steel structures to solve complex structural engineering problems using appropriate software tools and techniques following relevant IS Codes considering safety and serviceability.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on computer aided structural design and detailing.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	2	3	3	2	3	1		2					3		
CO2	6	2	3	3	2	3	1		2					3		
CO3	4									3	3			3		
Average		2	3	3	2	3	1		2	3	3			3		
Course Correlation Level		2	3	3	2	3	1		2	3	3			3		

Correlation Levels: 1: H – High 2: M – Medium 3: L - Low

DETAILED SYLLABUS:

SOFTWARE: STAAD.Pro or any other industry popular structural analysis and designsoftwares.

LIST OF EXERCISES

1. Analysis and design of simple beams
   a) Simply supported beam
   b) Cantilever beam
   c) Continuous beam
   d) Fixed beam
2. 2–D RCC Frame analysis and design
3. 3–D RCC Frame analysis and design

4. Analysis and design of Steel Truss
   a) Howe roof truss
   b) Howe bridge truss
   c) Warren truss
   d) Pratt truss
5. Simple tower analysis and design
6. Analysis and design of solid slab
7. Retaining wall analysis and design
8. Design of RCC Tee beam bridges for IRC loading
9. Analysis and design of INTZ type water tank
   a) Circular water tanks
   b) Rectangular water tanks
10. Analysis and design of plate girder bridge

TEXT BOOKS:

1. Shah, V. L., and Karve.,S.R., *Illustrated Design of Reinforced Concrete Building*, Structures Publication, Pune, 7th Edition, 2014.
2. Krishnamurthy. D., *Structural Design and Drawing,* Vol-II and Vol-III, CBS Publishers and Distributors, Delhi, 2006.

REFERENCE BOOKS:

1. *Computer Aided Design and Detailing Lab* (SVEC19 Regulations), Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.

CODES:

IS 456 – 2000 : Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi

IS 800 – 2007 : General Construction in Steel, Bureau of Indian Standards, New Delhi.

SP-16 – 1980 : Design Aids for Reinforced Concrete, Bureau of Indian Standards, New Delhi.

SP-34 – 1987 : Hand Book on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.

IV B. Tech. – I Semester

(20BT70132) REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	-	-	3	1.5

PRE-REQUISITES: Course on Surveying

COURSE DESCRIPTION: Creation of geo–database; Georeferencing and projection;Digitization of toposheet/map; Editing map elements; Spatial analysis tools; Developing digital elevation model; Preparation of thematic maps; Land use and land cover analysis; Study of feature estimation; Watershed analysis; Road network analysis; Rainfall-runoff analysis.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze toposheets, aerial photographs and satellite imagery to solve complex civil engineering problems using remote sensing and GIS tools following relevant standards and latest developments considering society, environment and sustainability.

CO2. Develop thematic maps for land use land cover, feature estimation, watershed management, road network and rainfall-runoff to solve complex civil engineering problems using remote sensing and GIS tools following relevant standards and latest developments considering society, environment and sustainability.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on remote sensing and GIS applications in civil engineering.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3		2	3	1	2	1		3		1			3
CO2	6	1	2	3	3	3	1	2	1		3		1			3
CO3	4									3	3					3
Average		1.5	2.5	1	2.5	3	1	2	1	3	3		1			3
Course Correlation Level		2	3	1	3	3	1	2	1	3	3		1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

LIST OF EXERCISES:

1. Creation of geo–database
2. Georeferencing and projection
3. Digitization of toposheet/map
4. Editing Map Elements
5. Spatial Analysis Tools
6. Developing digital elevation model
7. Preparation of thematic maps
8. Landuse and landcover analysis
9. Study of feature estimation
10. Watershed analysis
11. Road network analysis
12. Rainfall-runoff analysis

REFERENCE BOOKS/LABORATORY MANUALS:

1. *Remote Sensing and GIS Laboratory Manual (SVEC19 Regulations)*, Department of Civil Engineering, Sree Vidyanikethan Engineering College, Tirupati.
2. Lillesand, T. M., Kiefer, R. W. and J. W. Chipman, *Remote Sensing and Image Interpretation*, John Willey and Sons (Asia) Pvt. Ltd. 7th Edition, 2014.
3. Chandra, A. M. and Ghosh, S. K., *Remote Sensing and Geographic Information System*, Narosa Publishing House, 2nd Edition, 2015.

SOFTWARE/Tools used: ArcGIS.

IV B. Tech. – I Semester

(20BT70123) **GEOSPATIAL TECHNOLOGIES**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	2	-	-	2

PRE-REQUISITES: Course onSurveying.

COURSE DESCRIPTION: Photogrammetry; Global positioning system; Remote sensing; Geographic information system; GIS spatial analysis; Remote sensing and GIS applications.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze photogrammetry to solve complex surveying problems using appropriate tools and techniques following the relevant guidelines and latest developments considering society and environment besides communicating effectively in graphical form.

CO2. Analyze global positioning system and remote sensingto solve complex surveying problems using appropriate tools and techniques considering society and environment besides communicating effectively in graphical form.

CO3. Analyze GIS to solve complex surveying problems using appropriate tools and techniques following latest developments besides communicating effectively in graphical form.

CO4. Analyze GIS spatial analysis to solve complex surveying problems using appropriate tools and techniques following latest developments besides communicating effectively in graphical form.

CO5. Analyze remote sensing and GIS applications to solve complex civil engineering problems using appropriate tools and techniques following the relevant guidelines and latest developments considering society, environment, sustainability and management principles besides communicating effectively in graphical form.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	2	3			2	1	1	1		1		1			3
CO2	4	2	3		2	2	1	1	1		1					3
CO3	4	2	3			2	1	1	1		1		1			3
CO4	4	2	3			2	1	1	1		1		1			3
CO5	4	2	3			2	1	1	1		1		1			3
Average		2	3		2	2	1	1	1		1		1			3
Course Correlation Level		2	3		2	2	1	1	1		1		1			3

Correlation Levels: 3: High 2: Medium 1: Low

DETAILED SYLLABUS:

UNIT – I: PHOTOGRAMMETRY (09 Periods)
Principle of photogrammetry, Types of aerial photographs, Planning and execution of photographic flights, Geometry of aerial photographs, Scale of aerial photographs and its determination, Stereoscopy, Ground control, Mosaics, Parallax measurements for height determinations, Latest developments in photogrammetry.

UNIT – II:GLOBAL POSITIONING SYSTEM AND REMOTE SENSING (10 Periods)
Global Positioning System: Components of GPS – Space segment, Control segment, User segment, Reference systems, Satellite orbits; GPS observations, Applications.
Remote Sensing:Elements of remote sensing, Electromagnetic spectrum, Energy resources, Physics of radiant energy, Energy interactions with earth surface features and atmosphere, Data acquisition platforms Spectral reflectance curves, Resolution; Spectral properties of water bodies, soil and vegetation; Sensors and platforms, Visual interpretation techniques.

UNIT – III:GEOGRAPHIC INFORMATION SYSTEM (10 Periods)
GIS categories, Components of GIS, Fundamental operations of GIS, Spatial and non spatial data,Raster data and vector data, File management, Layer based GIS, Feature based GIS, Map projections, Latest developments.

UNIT – IV: GIS SPATIAL ANALYSIS (07 Periods)
Database models, Data storage, Vector data storage, Attribute data storage, Data manipulation and analysis, Integrated analysis of the spatial and attribute data - DTM/DEM; Softwares – ArcGIS, QGIS and Global mapper; Latest developments in GIS software.

UNIT – V:REMOTE SENSING AND GIS APPLICATIONS (09 Periods)
Land use/Land cover classification, Rainfall-runoff studies, Flood and drought impact assessment and monitoring, Drainage morphometry, Watershed management for sustainable development, Inland water quality survey and management, Regional and urban planning and management, GIS based highway alignment, GIS based traffic congestion analysis, Soil mapping – Case Studies.

Total Periods: 45

Topics for self-study are provided in the lesson plan

TEXT BOOKS:
1. Bhatta,B.,*Remote Sensing and GIS*, Oxford University Press,2nd Edition, 2011.
2. Anji Reddi, M., *A Text Book of Remote Sensing and Geographical Information Systems*, B. S. Publications,2nd Edition, 2012.

REFERENCE BOOKS:
1. Lillesand, T. M., Kiefer, R. W. and Chipman, J. W., *Remote Sensing and Image Interpretation*, John Willey and Sons (Asia) Pvt. Ltd., 7th Edition, 2014.
2. Chandra, A. M. and Ghosh, S. K., *Remote Sensing and Geographic Information System*, Narosa Publishing House, 2nd Edition, 2015.
3. Panigrahi, N.,*Geographical Information Science*, University Press,2nd Edition, 2013.
4. Peter A. Burragh and Rachael Mc Donnell, *Principles of Geographical Information Systems*, Oxford University Press, 2nd Edition, 2014.

ADDITIONAL LEARNING RESOURCES:
1. Basudeb Bhatta, *Remote Sensing and GIS*, Oxford, 2nd Edition, 2011.
2. Paul A. Longley, Michale F. Goodchild, David J. Maguire, David W Rhind, *Geographic Information Science and Systems,* 4th Edition, 2015.

IV B.Tech. - I semester

(20BT70133)**SUMMER INTERNSHIP - II**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	100	100	-	-	-	1.5

PREREQUISITES: -

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer's responsibilities and ethics; Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.

CO2. Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solvingcomplex engineering problems.

CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.

Mapping of COs with POs and PSOs:

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	4	3	3		3	3			3				3	3	3	3
CO2	4		3				3	3				3		3	3	3
CO3	4									3	3			3	3	3
Average		3	3		3	3	3	3	3	3	3	3	3	3	3	3
Course Correlation Level		3	3		3	3	3	3	3	3	3	3	3	3	3	3

Correlation Levels: 3: High 2: Medium 1: Low

IV B. Tech. – I Semester

(20BT701AC) SPREAD SHEET APPLICATIONS IN CIVIL ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	-	2	-

PRE-REQUISITES: MS Excel; Knowledge on Civil Engineering Courses.

COURSE DESCRIPTION: MS Excel as a spreadsheet tool; Spreadsheet creation; Design of slabs, Footings; Analysis of frames; Design of notches, Weirs; Design of pipes; Design of pavements.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Apply the principles of spreadsheet for the formation of cells, formatting and creation of tables following latest developments.
CO2. Design structures and structural components to solve complex structural engineeringproblems using spreadsheet tool following relevant codes considering safety, serviceability, environment,sustainability and cost effectiveness.
CO3. Design footings and pavements to solve complex geotechnical engineering and pavement engineering problems using spreadsheet tool following relevant codes considering safety, serviceability, environment,sustainability and cost effectiveness.
CO4. Design water resources and environmental engineering systems to solve complex engineering problems using spreadsheet tool following relevant codes considering safety, serviceability, environment,sustainability and cost effectiveness.
CO5. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on spread sheet applications in civil engineering.

Mapping of COs with POs and PSOs

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3											1			
CO2	6	1	2	3	2	3	1	1	2			1		3		
CO2	6	1	2	3	2	3	1	1	2			1		3		
CO4	6	1	2	3	2	3	1	1	2			1		3		
CO5	4									3	3			3		
Average		1.5	2	3	2	3	1	1	2	3	3	1	1	3		
Course Correlation Level		2	2	3	2	3	1	1	2	3	3	1	1	3		

Correlation Levels: H: High M: Medium L: Low

DETAILED SYLLABUS:

This laboratory provides training to the students in using MS Excelas a spreadsheet tool for various Civil Engineering Applications as mentioned below.

LIST OF EXERCISES:

1. Introduction to MS Excel as a Spreadsheet tool, overview of toolbars, accessing, saving excel files, using help and resources. Creating a spreadsheet using the features: Gridlines, format cells, summation, auto fill, formatting text, formulae in excel charts.
2. Creating a spreadsheet using the features: Split cells, Sorting, Conditional formatting, freeze panes, pivot tables, data validation.
3. Design of singly reinforced beam
4. Design of doubly reinforced beam
5. Design of one-way slab
6. Design of two-way slab
7. Design of isolated footings
8. Design of frames
9. Design of surplus weir
10. Design of trapezoidal notch
11. Design of canal regulator
12. Design of sewer pipe
13. Design of sewage treatment plant
14. Design of pavement

TEXT BOOKS:

1. Sylvan Charles Bloch, *Excel for Engineers and Scientists in Geotechnical Engineering*, Wiley, 2002.
2. Craig T. Christy, *Engineering with the Spreadsheet: Structural Engineering Templates using Excel*, ASCE Publications, 2006.

REFERENCE BOOKS:

1. Thomas F. Wolff, *Spreadsheet Applications in Geotechnical Engineering*, 1st Edition, PWS Publishing Company, 1995.

CODES:

IS 456 – 2000 : *Plain and Reinforced Concrete*, Bureau of Indian Standards, New Delhi.
IS 800 – 2007 : *General Construction in Steel*, Bureau of Indian Standards, New Delhi.
SP-16 – 1980 : *Design Aids for Reinforced Concrete*, Bureau of Indian Standards, New Delhi.
SP-34 – 1987 : *Hand Book on Concrete Reinforcement* and Detailing, Bureau of Indian Standards, New Delhi.

IV B.Tech. - II semester
(20BT80131) **PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PREREQUISITES: -

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Create/Design civil engineering systems or processes to solve complex civil engineering and allied problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.
CO2. Consider society, health, safety, environment, sustainability, economics and project management in solving complex civil engineering and allied problems.
CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on civil engineering systems or processes.

Mapping of COs with POs and PSOs:

Course Outcomes	Bloom's Level	Program Outcomes												Program Specific Outcomes		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	6	3	3	3	3	3			3				3	3	3	3
CO2	4		3				3	3				3		3	3	3
CO3	4									3	3			3	3	3
Average		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Course Correlation Level		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Levels: 3: High 2: Medium 1: Low

IV B.Tech. - II semester

(20BT80132) **INTERNSHIP**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
-	-	-	-	-	-	-

PREREQUISITES: -

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer‟s responsibilities and ethics; Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.
CO2. Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solvingcomplex engineering problems.
CO3. Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.