ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABI
OF
CIVIL ENGINEERING
FOR
B.TECH REGULAR FOUR YEAR DEGREE PROGRAM

(for the batches admitted from 2016-2017)

&

for B.TECH LATERAL ENTRY PROGRAM

(for the batches admitted from 2017-2018)

CHOICE BASED CREDIT SYSTEM

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

(Affiliated to JNTUA Anantapuramu, Approved by AICTE
Accredited by NBA; NAAC with 'A' grade)

Sree Sainath Nagar, A.Rangampet, Near Tirupati - 517 102. 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

Sree Vidyanikethan Engineering College 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 Civil Engineering education through teaching, research, consultancy and public service.

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 and consultancy.

PROGRAM EDUCATIONAL OBJECTIVES

After few years of completion of graduation, the graduate will be able to:

1. Pursue higher education in engineering or management or other areas of interest.
2. Address the contemporary issues in Civil Engineering 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

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

After the completion of the program, a successful student will be able to:

1. Apply knowledge of Construction Engineering, Environmental Engineering, Geotechnical Engineering, Structural Engineering, Surveying, Transportation Engineering and Water Resources Engineering in real time.
2. Analyse a system, component or process in sub-disciplines of civil engineering in real time problems.
3. Design a system, component, or process in more than one Civil Engineering context.
4. Conduct investigations and address complex civil engineering problems; Utilize and develop novel tools and techniques that are appropriate in civil engineering practice.

The Challenge of Change

*"**M**astery of change is in fact the challenge of moving human attention from an old state to a new state. Leaders can shift attention at the right time and to the right place. The real crisis of our times is the crisis of attention. Those who lead are the ones who can hold your attention and move it in a purposeful way. Transformation is nothing but a shift in attention from one form to another. The form of a beautiful butterfly breaks free from a crawling caterpillar. If you pay enough attention, you would be able to see how the butterfly hides within the caterpillar. The leader points out a butterfly when the follower sees only a caterpillar".*

- Debashis Chatterjee

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)
(Affiliated to J.N.T. University Anantapur, Anantapuramu)

ACADEMIC REGULATIONS

CHOICE BASED CREDIT SYSTEM

B.Tech. Regular Four Year Degree Program (for the batches admitted from the academic year 2016–17)
&
B.Tech. (Lateral Entry Scheme) (for the batches admitted from the academic year 2017–18)

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

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 2016-2017 onwards. Any reference to "College" in these rules and regulations stands for SVEC (Autonomous).

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 Academic Council in the forth coming 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 of study in Engineering:

3.1.1. Eligibility: A candidate seeking admission into the First Year of four year B.Tech. Degree Program should have
(i) 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, Anantapuramu) for admission as per the guidelines of Andhra Pradesh State Council of Higher Education (APSCHE).

(ii) secured a rank in the EAMCET examination conducted by APSCHE for allotment of a seat by the Convener, EAMCET for admission.

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).

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) Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or equivalent Diploma recognized by JNTUA, Anantapuramu).
(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:** 20% of the sanctioned strength in each Program of study as lateral entry students or as stipulated by APSCHE shall be filled 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 (Autonomous) leading to the award of B.Tech (Bachelor of Technology) Degree:
1) B.Tech (Civil Engineering)
2) B.Tech (Computer Science & Engineering)
3) B.Tech (Computer Science & Systems Engineering)
4) B.Tech (Electrical & Electronics Engineering)
5) B.Tech (Electronics & Communication Engineering)
6) B.Tech (Electronics & Instrumentation Engineering)
7) B.Tech (Information Technology)
8) B.Tech (Mechanical Engineering)

5. Duration of the Program:

5.1 **Minimum Duration:** The program will 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 will be divided into eight semesters with two semesters per year. Each semester shall normally consist of 22 weeks (?90 working days) 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 are followed. Provision is made for lateral entry of students in the Second Year of the program in all branches of study and they will 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.

First Semester (22 weeks)	Instruction Period: I Spell : 7 weeks II Spell: 9 weeks	16 weeks
	Mid-term Examinations: I Mid : 1 week II Mid : 1 week	2 weeks
	Preparation & Practical Examinations	2 weeks
	Semester-end examinations	2 weeks
	Semester Break	2 weeks
Second Semester (22 weeks)	Instruction Period: I Spell : 7 weeks II Spell: 9 weeks	16 weeks
	Mid-term Examinations: I Mid :1 week II Mid : 1 week	2 weeks
	Preparation & Practical Examinations	2 weeks
	Semester-end examinations	2 weeks
	Summer Vacation	6 weeks

6. Structure of the Program: Each Program of study shall consist of:
   (a) Foundation Courses,
   (b) Core Courses and Elective Courses.

♦ Foundation Courses are further categorized as :
   (i) HS (Humanities and Social Sciences),
   (ii) BS (Basic Sciences) and
   (iii) ES (Engineering Sciences).

♦ Core Courses and Elective Courses are categorized as PS (Professional Courses), which are further subdivided as:
   (i) PC (Professional Core) Courses,
   (ii) PE (Professional Electives),
   (iii) IDE (Inter Disciplinary Electives),
   (iv) OE (Open Electives),
   (v) Comprehensive Assessment
   (vi) Seminar
   (vii) PW (Project Work).

S.No	Broad Course Classification	Course Group/ Category	Course Type	Range of Credits
1.	Foundation Courses	HS – Humanities and Social Sciences	Humanities, Social Sciences and Management.	**5% - 10%**
2.		BS – Basic Sciences	Mathematics, Physics and Chemistry Courses, etc.	**15% - 20%**
3.		ES – Engineering Sciences	Fundamental engineering courses.	**15% - 20%**
4.	Core Courses	PC – Professional Core	Core courses related to the Parent Discipline/ Branch of Engg.	**30% - 40%**
5.	Elective Courses	PE – Professional Electives	Elective courses related to the Parent Discipline/ Branch of Engg.	**10% - 15%**
6.		IDE - Interdisciplinary Electives	Courses in an area outside the Parent Discipline / Branch of Engg.	**5% - 10%**
7.		OE – Open Electives	Common Elective courses offered for all programs / Branches of Engg.	**5% - 10%**
8.	Core Courses	Seminar	A course of study with discussion and report.	**10% - 15%**
9.		Comprehensive Assessment	A comprehensive review of foundations and key concepts of the courses studied.	
10.		Project Work	A course of planned minor research work.	

Contact Periods: Depending on the complexity and volume of the course, the number of contact periods per week shall be assigned.

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 Periods: Tutorial Periods: Practical Periods: Credits) Structure, based on the following general pattern.

- One Credit - for One Period/ Week/ Semester for Theory/ Lecture (L) Courses;
- Two Credits - for Three Periods/ Week/ Semester for Laboratory/ Practical (P) Courses.

- Tutorials will not carry Credits.

i) Other student activities like NCC, NSS, Sports, Study Tour, Guest Lecture etc. will not carry Credits.

ii) For courses like Project/Seminar/Comprehensive Online Assessment, 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 total of **180** credits (24 credits in each semester from I B. Tech. I Semester to IV B. Tech I Semester and 12 credits in IV B. Tech II Semester). However the curriculum for lateral entry students shall have a total of **132** credits (24 credits in each semester from II B. Tech. I Semester to IV B. Tech I Semester and 12 credits in IV B. Tech II Semester).

8. Choice Based Credit System (CBCS):

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

- Student centered learning
- Cafeteria approach
- Students to learn courses of their choice
- Learning at their own pace
- Interdisciplinary learning
- A student is introduced to "Choice Based Credit System (CBCS)"
- The total credits for the Program is **180** for regular students and **132** for lateral entry students.
- A student has a choice of registering for credits from the theory courses offered in the program ensuring the total credits in a semester are between 21 and 30.
- From the II B.Tech I Semester to IV B.Tech I Semester, the student has the option of registering for additional theory courses from the latter semesters or dropping existing theory courses of the current semester within the course structure of the program. However the number of credits the student can register in a particular semester should not below 21 (minimum) and should not exceed 30 (maximum).
- Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

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

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 programme 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 will 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) within Ten days before commencement of the concerned semester and complete the registration process duly authorized by the Chairman, Board of studies of concern 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 No course shall be offered by a Department unless a minimum of 40 students register for that course.

10. Massive Open Online Course (MOOC)

A Massive Open Online Course (MOOC) is an online course aimed at unlimited participation and open access via the web. MOOC is a model for delivering learning content online to any person who takes a course, with no limit on attendance.

- A student shall undergo a "Massive Open Online Course (MOOC)" for award of the degree besides other requirements.
- A student is offered this Online Course at the beginning of his III B.Tech I Semester of study and the course has to be completed by the end of III B.Tech II Semester. If the student fails to complete the course by the end of III B.Tech II Semester, it shall be treated as a backlog and needs to be completed before completion of the program for the award of the degree.
- The student shall confirm registration by enrolling the course within 10 days prior to the last instructional day of the II B. Tech. II Semester like other courses.
- The courses will be approved by the Chairman, Academic Council, SVEC based on the recommendations of the Chairman, Board of Studies of concerned program considering current needs.
- A student has a choice of registering for only one MOOC with the recommendation of Chairman, Board of studies of concerned program and duly approved by the Chairman, Academic Council, SVEC.

- The student shall undergo MOOC without disturbing the normal schedule of regular class work.
- One faculty member assigned by the Head of the Department shall be responsible for the periodic monitoring of the course implementation.
- No formal lectures need be delivered by the faculty member assigned to the students.
- If any student wants to change the MOOC course already registered, he will be given choice to register a new MOOC course in III B. Tech. only, with the recommendation of Chairman, Board of studies of concerned program and duly approved by the Chairman, Academic Council, SVEC.
- Finally, the performance of the student in the course will be evaluated as stipulated by the course provider. A certificate will be issued on successful completion of the course by the course provider.
- The performance in the MOOC will not be considered for the calculation of SGPA and CGPA of the student.
- The MOOC course will be listed in the grade sheet of the student.

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

11.1 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.

11.2 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 application downloaded from website and duly filled by the student shall be submitted to the Head of the Department. In the case of start-up for incubation of idea only, the application for break of study shall be forwarded by the Head of the Department to the Principal, SVEC. A sub-committee appointed by the principal shall give recommendations for approval.

11.3 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, SVEC in the prescribed format through Head of the Department at the beginning of the readmitted semester itself for prescribing additional/equivalent courses, if any, from any semester of the regulations in-force, so as to bridge the curriculum in-force and the old curriculum.

11.4 The total period for completion of the programme reckoned from the commencement of the I B.Tech I Semester to which the student was admitted shall not exceed the maximum period specified in clause 5.2 irrespective of the period of break of study in order that the student may be eligible for the award of the degree (vide clause 18).

11.5 In case, if a student applies for break of study for one year and wishes to extend it for one more consecutive year, he shall be permitted with the prior approval of the Principal, SVEC through the concerned Head of the Department before beginning of the semester in which the student has taken break of study.

11.6 If a student has not reported to the department after approved period of break of study without any intimation, the student is treated as detained in that semester. Such students are eligible for readmission for the semester when offered next.

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

Sl. No.	Course	Marks	Examination and Evaluation		Scheme of examination
1.	Theory	70	Semester-end examination of 3 hours duration (External evaluation)		The examination question paper in theory courses shall be for a maximum of 70 marks. The question paper shall be of descriptive type with 5 questions, taken one from each unit of syllabus, having internal choice and all 5 questions shall be answered. All questions carry equal marks.
		30	Mid-term Examination of 2 hours duration (Internal evaluation).		The question paper shall be of descriptive type with 4 essay type questions out of which 3 are to be answered and evaluated for 24 marks and also 6 short answer questions out of which all are to be answered and evaluated for 6 marks. Two mid-term examinations each for 30 marks are to be conducted. For a total of 30 marks, 75% of better one of the two and 25% of the other one are added and finalized. **Mid-I:** After first spell of instruction (I to II Units). **Mid-II**: After second spell of instruction (III to V Units).
2	Laboratory	50	Semester-end Lab Examination for 3 hours duration (External evaluation)		50 marks are allotted for laboratory/drawing examination during semester-end.
		50	30	Day-to-Day evaluation for Performance in laboratory experiments and Record. (Internal evaluation).	Two laboratory examinations, which includes Day-to-Day evaluation and Practical test, each for 50 marks are to be evaluated. For a total of 50 marks 75% of better one of the two and 25% of the other one are added and finalized. **Laboratory examination-I:** Shall be conducted just before I mid-term examinations. **Laboratory examination-II:** Shall be conducted just before II mid-term examinations.
			20	Practical test (Internal evaluation).	
3	a) Seminar	100	Semester-end Examination		100 marks are allotted for Seminar during semester-end evaluation by the Seminar Evaluation Committees (**SECs**) as given in 12.2.1.
	b)Comprehensive Assessment	100	Semester-end Examination		Comprehensive Assessment shall be conducted as given in 12.2.2 as semester-end evaluation for 100 marks.
4	Project Work	200	100	External evaluation	Semester-end Project Viva-Voce Examination by Committee as detailed in 12.2.3 for 100 marks.
			100	Internal evaluation	Continuous evaluation by the Project Evaluation Committees (**PECs**) as detailed in 12.2.3 for 100 marks.

12.2 Seminar/Comprehensive Assessment /Project Work Evaluation:

12.2.1 For the seminar, the student shall collect information through literature survey on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the Department just before presentation. The report and the presentation shall be evaluated at the end of the semester by the Seminar Evaluation Committees (SECs), each consisting of concerned supervisor and two senior faculty members. The SECs are constituted by the Principal on the recommendations of the Head of the Department.

12.2.2 Comprehensive Assessment shall be conducted by the department through (i) online with 50 objective questions for 50 marks and (ii) viva-voce for the remaining 50 marks, covering all the courses from I B.Tech I Semester to IV B.Tech I Semester. The viva-voce will be conducted by Comprehensive Assessment Committees (CACs), each consisting of three faculty members (out of whom at least two are seniors). The CACs are constituted by the Principal on the recommendations of the Head of the Department. The HODs of the respective departments are given the responsibility of preparing question bank/question paper for conducting the online examination.

12.2.3 The project 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 conducted at the end of the IV B.Tech II Semester. The Internal Evaluation shall be made by the Project Evaluation Committees (PECs), each consisting of concerned supervisor and two senior faculty members on the basis of two project reviews conducted on the topic of the project. The PECs are constituted by the Principal on the recommendations of the Head of the Department.

12.3. Eligibility to appear for the semester-end examination:

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

12.3.2 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.

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

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

12.3.5 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 will not be allowed to register for the courses of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

12.3.6 A stipulated fee shall be payable to the College towards condonation of shortage of attendance.

12.4. Evaluation: Following procedure governs the evaluation.

12.4.1. Marks for components evaluated internally by the faculty shall be submitted to the Controller of Examinations one week before the commencement of the 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 total marks for any course in that semester.

12.4.2. 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.

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

12.5. Personal verification / Revaluation / Recounting:
Students shall be permitted for personal verification/request for recounting/ revaluation of the Semester-end examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, 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.

12.6. 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.

13. 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:

13.1 A student shall be deemed to have satisfied the minimum academic requirements for each theory, laboratory course and project work, if he secures not less than 40% 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. For the seminar and comprehensive Viva-Voce, he should secure not less than 40% of marks in the semester-end examination.

13.2 A student shall be promoted from second year to third year of Program of study only if he fulfills the academic requirement of securing 36 credits from

a. Two regular and one supplementary examinations of I B.Tech I Semester.

b. O ne regular and one supplementary examinations of I B.Tech II Semester.

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

Irrespective of whether or not the candidate appears for the semester-end examination as per the normal course of study.

13.3 A student shall be promoted from third year to fourth year of Program of study only if he fulfills the academic requirements of securing 60 credits from the following examinations,

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

b. Two regular and two supplementary examinations of I B.Tech II Semester.

c. Two regular and one 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.

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 by sections 13.2 and 13.3 above, the student may make up the credits through supplementary examinations.

13.4 A student shall register for all the 180 credits and earn all the 180 credits. Marks obtained in all the 180 credits shall be considered for the calculation of the DIVISION based on CGPA.

13.5 A student who fails to earn 180 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 2017-2018):

13.6 A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical course and project, if he secures not less than 40% 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. For the seminar and comprehensive Viva-Voce, he should secure not less than 40% of marks in the semester-end examination.

13.7 A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of securing 36 credits from the following examinations.

a. Two regular and one 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.

13.8 A student shall register for all 132 credits and earn all the 132 credits. Marks obtained in all the 132 credits shall be considered for the calculation of the DIVISION based on CGPA.

13.9 A student who fails to earn 132 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.

14. 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 will 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.

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

15.1. 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.

Grades conversion and Grade points attached

% of Marks obtained	Grade	Description of Grade	Grade Points (GP)
> = 95	O	Outstanding	10
> = 85 to < 95	S	Superior	9
> = 75 to < 85	A	Excellent	8
> = 65 to < 75	B	Very Good	7
> = 55 to < 65	C	Good	6
> = 45 to < 55	D	Fair	5
> = 40 to < 45	E	Pass	4
< 40	F	Fail	0
Not Appeared	N	Absent	0

Pass Marks: A student shall be declared to have passed theory course, laboratory course and project work if he secures minimum of 40% marks in external examination, and a minimum of 40% marks in the sum total of internal evaluation and external examination taken together. For the seminar and comprehensive Assessment, he shall be declared to have passed if he secures minimum of 40% of marks in the semester-end examination. 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.

15.2. 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 at the end of each semester:

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

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 passed all the courses in that Semester.

15.3. Cumulative Grade Point Average (CGPA):

The CGPA for any student is awarded only when he completes the Program i.e., when the student passes in all the courses prescribed in 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.

16. **Grade Sheet:** A grade sheet (Marks Memorandum) shall be issued to each student indicating his performance in all courses registered in that semester indicating the **SGPA.**

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

18. **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 of SVEC (Autonomous).

18.1. **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.

18.2. **Award of Division:** Declaration of Division is based on CGPA.

Awarding of Division

CGPA	Division
> = 7.0	First Class with Distinction
> = 6.0 and < 7.0	First Class
> = 5.0 and < 6.0	Second Class
> = 4.0 and < 5.0	Pass Class

19. **Additional academic regulations:**

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

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

19.3 Courses such as Project, Seminar and Comprehensive Assessment may be repeated only by registering in supplementary examinations.

19.4 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 will be done accordingly.

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

20. 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 will not be allowed/ promoted to the next higher semester.

21. 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.

22. Attendance for student development activity periods indicated in the class time tables shall be considered as in the case of a regular course for calculation of overall percentage of attendance in a semester.

23. 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.

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(Autonomous)

COURSE STRUCTURE (2016-2017)

CIVIL ENGINEERING

I B.Tech. (I Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
I Year - I Semester										
1.	16BT1HS01	Technical English	3	1	-	4	3	30	70	100
2.	16BT1BS01	Engineering Chemistry	3	1	-	4	3	30	70	100
3.	16BT1BS03	Matrices and Numerical Methods	3	1	-	4	3	30	70	100
4.	16BT1BS04	Multi–Variable Calculus and Differential Equations	3	1	-	4	3	30	70	100
5.	16BT10501	Programming in C	3	1	-	4	3	30	70	100
6.	16BT1HS31	English Language Lab	-	-	3	3	2	50	50	100
7.	16BT1BS31	Engineering Chemistry Lab	-	-	3	3	2	50	50	100
8.	16BT10331	Computer Aided Engineering Drawing	-	1	6	7	3	50	50	100
9.	16BT10531	Programming in C Lab	-	-	3	3	2	50	50	100
		Total	**15**	**6**	**15**	**36**	**24**	**350**	**550**	**900**

I B.Tech. (II Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
I Year - II Semester										
1.	16BT1BS02	Engineering Physics	3	1	-	4	3	30	70	100
2.	16BT2BS01	Transformation Techniques and Partial Differential Equations	3	1	-	4	3	30	70	100
3.	16BT20101	Building Materials and Construction Technology	3	1	-	4	3	30	70	100
4.	16BT20102	Engineering Mechanics	4	1	-	5	4	30	70	100
5.	16BT20241	Basic Electrical and Electronics Engineering	3	1	-	4	3	30	70	100
6.	16BT1BS32	Engineering Physics Lab	-	-	3	3	2	50	50	100
7.	16BT20131	Building Materials and Construction Technology Lab	-	-	3	3	2	50	50	100
8.	16BT20252	MATLAB Practice for Civil Engineers	-	1	3	4	2	50	50	100
9.	16BT20331	Engineering Workshop Practice	-	-	3	3	2	50	50	100
		Total	16	6	12	34	24	350	550	900

II B.Tech. (I Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
II Year - I Semester										
1.	16BT3BS01	Probability Distributions and Statistical Methods	3	1	-	4	3	30	70	100
2.	16BT3HS02	Managerial Economics and Principles of Accountancy	3	1	-	4	3	30	70	100
3.	16BT30101	Construction Planning and Project Management	3	1	-	4	3	30	70	100
4.	16BT30102	Fluid Mechanics and Hydraulic Machinery	3	1	-	4	3	30	70	100
5.	16BT30103	Mechanics of Solids	3	1	-	4	3	30	70	100
6.	16BT30104	Surveying	3	1	-	4	3	30	70	100
7.	16BT30131	Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	3	2	50	50	100
8.	16BT30132	Strength of Materials Lab	-	-	3	3	2	50	50	100
9.	16BT30133	Surveying Lab	-	-	3	3	2	50	50	100
		Total	**18**	**6**	**9**	**33**	**24**	**330**	**570**	**900**

II B.Tech. (II Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits (C)	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
II Year - II Semester										
1.	16BT3HS01	Environmental Studies	3	-	-	3	3	30	70	100
2.	16BT40101	Concrete Technology	3	1	-	4	3	30	70	100
3.	16BT40102	Engineering Geology	3	1	-	4	3	30	70	100
4.	16BT40103	Engineering Hydrology	3	1	-	4	3	30	70	100
5.	16BT40104	Structural Analysis-I	3	1	-	4	3	30	70	100
6.	16BT40105	Water Supply Engineering	3	1	-	4	3	30	70	100
7.	16BT40131	Concrete Technology Lab	-	-	3	3	2	50	50	100
8.	16BT40132	Engineering Geology Lab	-	-	3	3	2	50	50	100
9.	16BT4HS31	Soft Skills Lab	-	-	3	3	2	50	50	100
		Total	**18**	**5**	**9**	**32**	**24**	**330**	**570**	**900**

III B.Tech. (I Semester)

S. No.	Course Code	Course Title	Course Category				Credits	Scheme of Examination		
			Contact Periods/ Week				(C)	Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
III Year - I Semester										
1.	16BT50101	Irrigation Engineering	3	1	-	4	3	30	70	100
2.	16BT50102	Reinforced Cement Concrete Structures	3	1	-	4	3	30	70	100
3.	16BT50103	Soil Mechanics	3	1	-	4	3	30	70	100
4.	16BT50104	Structural Analysis-II	3	1	-	4	3	30	70	100
5.	16BT50105	Wastewater Technology	3	1	-	4	3	30	70	100
6.		Interdisciplinary Elective-1	3	1	-	4	3	30	70	100
	16BT50441	1. Principles of Image Processing								
	16BT5HS01	2. Costing and Finance Management for Civil Engineers								
	16BT50241	3. Renewable Energy								
	16BT70308	4. Computational Fluid Dynamics								
7.	16BT50131	Computer Aided Building Planning and Drawing	-	1	3	4	2	50	50	100
8.	16BT50132	Environmental Engineering Lab	-	-	3	3	2	50	50	100
9.	16BT50133	Geotechnical Engineering Lab	-	-	3	3	2	50	50	100
		Total	**18**	**7**	**9**	**34**	**24**	**330**	**570**	**900**

III B.Tech. (II Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits	Scheme of Examination Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
III Year - II Semester										
1.	16BT60101	Foundation Engineering	3	1	-	4	3	30	70	100
2.	16BT60102	Highway and Traffic Engineering	3	1	-	4	3	30	70	100
3.	16BT60103	Steel Structures	3	1	-	4	3	30	70	100
4.	**Interdisciplinary Elective-2**		3	1	-	4	3	30	70	100
	16BT40502	1. Data Base Management Systems								
	16BT50341	2. Optimization Techniques								
	16BT60104	3. Fire Engineering								
	16BT60241	4. Energy Audit and Conservation								
5.	**Program Elective – 1**		3	1	-	4	3	30	70	100
	16BT60105	1. Advanced Reinforced Cement Concrete Structures								
	16BT60106	2. Advanced Structural Analysis								
	16BT60107	3. Advanced Surveying								
	16BT60108	4. Geoenvironmental Engineering								
	16BT60109	5. Groundwater Development and Management								
	16BT60110	6. Solid Waste Management								
	16BT60111	7. Structural Health Monitoring								
6.	**Open Elective**		3	1	-	4	3	30	70	100
7.	16BT60131	Computer Aided Design and Detailing Lab	-	-	3	3	2	50	50	100
8.	16BT60132	Highway Engineering Lab	-	-	3	3	2	50	50	100
9.	16BT60133	Seminar	-	-	-	-	2	-	100	100
10.	16BT6MOOC	MOOC	-	-	-	-	-	-	-	-
		Total	**18**	**6**	**6**	**30**	**24**	**280**	**620**	**900**

Sl. No.	Course Code	Open Elective Course Title	Sl. No.	Course Code	Open Elective Course Title
1.	16BT6HS01	Banking and Insurance	16.	16BT60114	Disaster Mitigation and Management
2.	16BT6HS02	Business Communication and Career Skills	17.	16BT60115	Environmental Pollution and Control
3.	16BT6HS03	Cost Accounting and Financial Management	18.	16BT60116	Planning for Sustainable Development
4.	16BT6HS04	Entrepreneurship for Micro, Small and Medium Enterprises	19.	16BT60117	Professional Ethics
5.	16BT6HS05	French Language	20.	16BT60118	Rural Technology
6.	16BT6HS06	German Language	21.	16BT60308	Global Strategy and Technology
7.	16BT6HS07	Indian Constitution	22.	16BT60309	Intellectual Property Rights and Management
8.	16BT6HS08	Indian Economy	23.	16BT60310	Managing Innovation and Entrepreneurship
9.	16BT6HS09	Indian Heritage and Culture	24.	16BT60311	Materials Science
10.	16BT6HS10	Indian History	25.	16BT70412	Green Technologies
11.	16BT6HS11	Personality Development	26.	16BT70413	Introduction to Nanoscience and Technology
12.	16BT6HS12	Philosophy of Education	27.	16BT60505	Engineering System Analysis and Design
13.	16BT6HS13	Public Administration	28.	16BT71011	Micro-Electro-Mechanical Systems
14.	16BT60112	Building Maintenance and Repair	29.	16BT61205	Cyber Security and Laws
15.	16BT60113	Contract Laws and Regulations	30.	16BT61505	Bio-informatics

IV B.Tech. (I Semester)

S. No.	Course Code	Course Title	Course Category / Contact Periods/ Week				Credits (C)	Scheme of Examination / Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
IV Year - I Semester										
1.	16BT70101	Estimation and Quantity Surveying	3	1	-	4	3	30	70	100
2.	16BT70102	Geospatial Technologies	3	1	-	4	3	30	70	100
3.	16BT70103	Railway, Airport and Harbour Engineering	3	1	-	4	3	30	70	100
4.		Program Elective – 2	3	1	-	4	3	30	70	100
	16BT70104	1. Advanced Foundation Engineering								
	16BT70105	2. Architecture and Town Planning								
	16BT70106	3. Environmental Impact Assessment and Management								
	16BT70107	4. Global Positioning System (GPS)								
	16BT70108	5. Structural Dynamics								
	16BT70109	6. Transportation Planning and Management								
	16BT70110	7. Water Resources Systems Planning and Management								
5.		Program Elective – 3	3	1	-	4	3	30	70	100
	16BT70111	1. Advanced Steel Structures								
	16BT70112	2. Earthquake Resistant Design of Structures								
	16BT70113	3. Highway Construction and Maintenance								
	16BT70114	4. Industrial Wastewater Treatment								
	16BT70115	5. Infrastructure Development and Management								
	16BT70116	6. Soil Dynamics and Machine Foundations								
	16BT70117	7. Watershed Management								
6.		Program Elective – 4	3	1	-	4	3	30	70	100
	16BT70118	1. Air Pollution and Control								
	16BT70119	2. Bridge Engineering								
	16BT70120	3. Ground Improvement Techniques								
	16BT70121	4. Hydro Power Engineering								
	16BT70122	5. Pavement Analysis and Design								
	16BT70123	6. Prestressed Concrete								
	16BT70124	7. Rehabilitation and Retrofitting of Structures								
7.	16BT70131	Civil Engineering Software Lab	-	-	3	3	2	50	50	100
8.	16BT70132	Remote Sensing and Geographical Information Systems Lab	-	-	3	3	2	50	50	100
9.	16BT70133	Comprehensive Assessment	-	-	-	-	2	-	100	100
Total			**18**	**6**	**6**	**30**	**24**	**280**	**620**	**900**

IV B.Tech. (II Semester)

S. No.	Course Code	Course Title	Contact Periods/ Week				Credits (C)	Scheme of Examination / Max. Marks		
			L	T	P	Total		Internal Marks	External Marks	Total Marks
IV Year - II Semester										
1.	16BT80131	Project Work*	-	-	-	-	12	100	100	200
Total			-	-	-	-	**12**	**100**	**100**	**200**

*Full-time project work

I B. Tech. - I Semester

(16BT1HS01) **Technical English**

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITE: English at Intermediate level

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

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

CO1. Demonstrate knowledge in
- a. Process of communication
- b. Modes of listening
- c. Paralinguistic features
- d. Skimming and Scanning
- e. Elements of style in writing

CO2. Analyze the possibilities and limitations of language for understanding
- a. Barriers to Communication
- b. Barriers to Effective Listening
- c. Barriers to Speaking
- d. Formal and metaphorical language

CO3. Design and develop functional skills for professional practice**.**

CO4. Apply writing skills in preparing and presenting documents

CO5. Function effectively as an individual and as a member in diverse teams.

CO6. Communicate effectively with the engineering community and society in formal and informal situations**.**

DETAILED SYLLABUS:

UNIT I: INTRODUCTION TO COMMUNICATION (9 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 (9 periods)

Introduction – Reasons for poor Listening – 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 (9 periods)

Introduction – Achieving Confidence, Clarity and Fluency – Paralinguistic Features – Barriers to Speaking – Types of Speaking – Persuasive Speaking

UNIT IV: READING (9 periods)

Introduction and Reading Rates – Reading and Interpretation – Intensive and Extensive Reading – Critical Reading – Reading for Different Purposes – SQ3R Reading Technique –Study Skills

UNIT V: WRITING (9 periods)

Introduction – Language – Elements of Style – Techniques for Good Technical Writing – Referencing and Styling – Right Words and Phrases – Sentences

Total Periods: *45*

TEXT BOOKS:

1. Meenakshi Raman & Sangeetha Sharma, *Technical Communication*, Oxford University Press, New Delhi, 2012.

REFERENCE BOOKS:

1. Ashraf Rizvi*, Effective Technical Communication*, McGraw-Hill Education (India) Pvt.Ltd., New Delhi, 2015.
2. Sanjay Kumar & Pushp Lata, *Communication Skills*, Oxford University Press, New Delhi, 2013.
3. Teri Kwal Gamble and Michael Gamble, *Communication Works*, Tata Mc Graw-Hill, New Delhi, 2010.
4. Rajendra Pal and J.S. Korlahalli, *Essentials of Business Communication*, Sultan Chand and Sons (P) Ltd, New Delhi, 2010.

I-B. Tech - I Semester

(16BT1BS01): **ENGINEERING CHEMISTRY**

(Common to CSE, CSSE, IT, CE & ME)

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

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Water technology, Chemistry of Engineering materials, Nanochemistry, Green Chemistry, Electro chemical cells, Sensors, Corrosion and Lubricants.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1: Acquire basic knowledge in water technology, engineering plastics, conducting polymers, composites, Electro chemical cells, Nano Chemistry, principles of Green Chemistry, corrosion phenomenon and lubricants.

CO2: Develop analytical skills in:
- a. Determination of hardness of water.
- b. Determination of viscosity, flame and fire points, cloud and pour points.

CO3: Develop designing skills in:
- a. Synthesis of engineering plastics.
- b. Chemical methods for the synthesis of Nano materials.

CO4: Develop skills for providing solutions through:
- a. Mitigation of hardness of water.
- b. Newer Nanomaterials and engineering plastics for specific applications

CO5: Acquire awareness to practice engineering in compliance to modern techniques such as:
- a. Nalgonda technique for defluoridation of water
- b. Electroplating technique for control of corrosion.

CO6: Acquire awareness to societal issues on:
- a. Quality of water.
- b. Bio-diesel
- c. Chemical materials utility and their impact.

DETAILED SYLLABUS:

UNIT–I: WATER TECHNOLOGY (9 periods)

Introduction: Types of water, impurities in water and their consequences, types of hardness of water, units of hardness of water, disadvantages of hardness of water, estimation of hardness of water by EDTA method, Boiler troubles: Scales and Sludges, Caustic embrittlement, Boiler corrosion and Priming and Foaming.

Softening of water: Zeolite process and Ion exchange process, advantages and disadvantages. Desalination of brackish water by Reverse Osmosis, Numerical problems on estimation of hardness of water.

Fluorides in water: Effects on human health, defluoridation method-Nalgonda method; comparison of merits and demerits of various defluoridation methods (Nalgonda, Bone Charcoal, Activated Alumina, Contact precipitation, Brick, Reverse osmosis).

UNIT – II: CHEMISTRY OF ENGINEERING MATERIALS (9 periods)

Engineering Plastics: Definition, general properties, synthesis, properties and applications of PC, PTFE, and PMMA.

Conducting polymers: Definition, types of conducting polymers: Intrinsic and extrinsic conducting polymers with examples, engineering applications of conducting polymers.

Biodegradable polymers: Definition, properties, classification, mechanism of degradation of biodegradable polymers and their applications.

Composites – Introduction, types of composites: fiber reinforced particulate and layered composites with examples, advantages of composites and applications.

UNIT– III: NANOCHEMISTRY AND GREEN CHEMISTRY (9 periods)

Nanochemistry: Introduction, classification, properties and applications of Nano materials (nano particles, nano tubes, nano wires, nano composites, dendrimers); synthesis of Nano materials – Sol-gel process.

Green Chemistry: Introduction, principles of green chemistry, Tools of Green Chemistry with Examples, Applications of Green Chemistry in science and technology.

Biodiesel: Introduction, Synthesis (Trans esterification method), advantages, disadvantages and applications.

UNIT–IV: ELECTROCHEMICAL CELLS AND SENSORS (9 periods)

Electrochemical cell: Introduction, EMF of an electrochemical cell.

Batteries: Introduction, types of Batteries: primary and secondary batteries with examples, Ni-Cd batteries, Lithium-ion batteries, Lithium- Polymer batteries, Applications of batteries.

Fuel Cells: Definition, examples: $H_2 - O_2$ Fuel cell, solid oxide fuel cell, Bio-fuel cell and applications of fuel cells.

Sensors - Introduction, Types of Sensors, electrochemical sensor: construction and working principle of potentiometric sensor, and applications of electrochemical sensors.

UNIT–V: CORROSION AND LUBRICANTS (9 periods)

Corrosion: Introduction, Definition, types of corrosion (dry and wet corrosion), galvanic corrosion, concentration cell corrosion, Factors influencing corrosion, Corrosion control: cathodic protection; sacrificial anodic protection and impressed current cathodic protection; protective coatings: Galvanizing and Electroplating (Nickel).

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

Total periods: 45 periods

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 & C. Ramachandraiah **Engineering Chemistry**, Mc. Graw-Hill Higher Education, Hyderabad, 1st edition, 2015.

REFERENCE BOOKS:

1. A.K. Bandyopadhyay, **Nano Materials,** New Age international publishers, 2nd edition, 2014.
2. Paul T. Anastas and John C Warner, **Green Chemistry: Theory and practice,** Oxford University Press, 2000.

I B. Tech. - I Semester

(16BT1BS03) MATRICES AND NUMERICAL METHODS

(Common to all Branches)

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

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fundamentals of matrix theory; numerical solutions of equations, curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO1: Acquire basic **knowledge** in
- (a) Finding the rank of matrices and analyzing them.
- (b) Solving algebraic and transcendental equations by various numerical methods.
- (c) Fitting of various types of curves to the experimental data.
- (d) Estimating the missing data through interpolation methods.
- (e) Identification of errors in the experimental data
- (f) Finding the values of derivatives and integrals through various numerical methods.
- (g) Solving differential equations numerically when analytical methods fail.

CO2: Develop skills in **analyzing** the
- (a) methods of interpolating a given data
- (b) properties of interpolating polynomials and derive conclusions
- (c) properties of curves of best fit to the given data
- (d) algebraic and transcendental equations through their solutions
- (e) properties of functions through numerical differentiation and integration
- (f) properties of numerical solutions of differential equations

CO3: Develop skills in **designing** mathematical models for
(a) Fitting geometrical curves to the given data
(b) Solving differential equations
(c) Constructing polynomials to the given data and drawing inferences.

CO4: Develop numerical skills in **solving the problems** involving
(a) Systems of linear equations
(b) Fitting of polynomials and different types of equations to the experimental data
(c) Derivatives and integrals
(d) Ordinary differential equations

CO5: Use relevant numerical **techniques** for
(a) Diagonalising the matrices of quadratic forms
(b) Interpolation of data and fitting interpolation polynomials
(c) Fitting of different types of curves to experimental data
(d) obtaining derivatives of required order for given experimental data
(e) Expressing the functions as sum of partial fractions

DETAILED SYLLABUS:

UNIT–I : MATRICES (11 periods)

Rank of a matrix, echelon form, normal form, inverse of a matrix by elementary row operations. Solutions of linear system of equations. Eigen values, Eigen vectors and properties (without proof), Diagonalization. Quadratic form (QF), reductions to canonical form using orthogonal transformation and nature of QF.

UNIT-II NUMERICAL SOLUTIONS OF EQUATIONS AND CURVE FITTING (8 periods)

Solutions of Algebraic and Transcendental equations by bisection method, Regula-Falsi method, Newton – Raphson's method. Curve fitting by the principle of least squares, fitting of a straight line, parabola and exponential curves.

UNIT- III INTERPOLATION (8 periods)

Interpolation, difference operators and their relationships, Newton's forward and backward formulae, Lagrange's interpolation formula. Partial fractions using Lagrange's interpolation formula.

UNIT-IV NUMERICAL DIFFERENTIATION AND INTEGRATION (8 periods)

Numerical differentiation using Newton's forward and backward formulae. Numerical integration using Trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.

UNIT- V NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS (10 periods)

Numerical solutions of first order Initial value problems using Taylor series method, Euler's method , modified Euler's method, Runge – Kutta method (4^{th}order only) and Milne's predictor – corrector method.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N.Prasad, ***Mathematical Methods,*** S.Chand and Company, 8/e, 2013

REFERENCE BOOKS:

1. B.S. Grewal, ***Higher engineering mathematics***, Khanna Publishers, 42^{nd} Edition. 2012
2. S.S.Sastry, ***Introductory methods of Numerical Analysis***, Prentice Hall of India, 5/e, 2013

I B. Tech. - I Semester

(16BT1BS04) MULTI-VARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

(Common to all Branches)

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

PRE-REQUISITES: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: First order differential equations; higher order linear differential equations; functions of several variables; applications of integration; multiple integrals; vector calculus.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO1: Acquire knowledge in
- (a) Higher order Differential equations
- (b) Maximum and minimum values for the functions of several variables
- (c) Double and triple integrals
- (d) Differentiation and integration of vector functions.
- (e) Line and surface volume
- (f) transforming integrals from three dimensional surfaces and volumes on to plane surfaces

CO2: Develop skills in analyzing the
- (a) methods for differential equation for obtaining appropriate solutions,
- (b) Properties of oscillatory electrical circuits and heat transfer in engineering systems
- (c) The variations in the properties of functions near their stationary values
- (d) Flow patterns of fluids, electrical and magnetic flux and related aspects

CO3: Develop skills in designing mathematical models for
- (a) R-C and L-R-C oscillatory electrical circuits
- (b) Heat transfer and Newton's law of cooling
- (c) Engineering concepts involving lengths of curves and areas of planes, Flux across surfaces

CO4: Develop analytical skills in solving the problems involving
- (a) Newton's law of cooling
- (b) non homogeneous linear differential equations
- (c) maximum and minimum values for the functions

(d) lengths of curves, areas of surfaces and volumes of solids in engineering
(e) transformation of integrals from three dimensional surfaces and volumes on to plane surfaces

CO5: Use relevant mathematical techniques for evaluating
(a) various types of particular integrals in differential equations
(b) stationary values for multi variable functions
(c) multiple integrals in change of variables
(d) integrations of vector functions.

DETAILED SYLLABUS:

UNIT-I: FIRST ORDER DIFFERENTIAL EQUATIONS (6 periods)

Linear and Bernoulli type, exact equations and reducible to exact. Orthogonal trajectories (Both Cartesian and polar forms). Newton's law of cooling.

UNIT II: HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS (9 periods)

Method for solution of linear equations- Differential operator *D*, Solution of second order linear homogeneous equations with constant coefficients, Solution of Higher order homogeneous linear equations with constant coefficients, **Solution of Non homogeneous linear equations**-Operator methods for finding particular integrals- for cases – e^{ax}, sin ax, cos ax, x^n, e^{ax} V(x), xV(x). Method of Variation of parameters. Applications to oscillatory electrical circuits.

UNIT-III: FUNCTIONS OF SEVERAL VARIABLES (8 periods)

Functions of Two Variables: Limits, Continuity; **Partial Derivatives**: Total Differential and Derivatives, Jacobian, Functional dependence, Taylor's Theorem, maxima and minima of functions of two variables with and without constraints – Lagrange's method of undetermined multipliers.

UNIT-IV: APPLICATIONS OF INTEGRATION AND MULTIPLE INTEGRALS (10 periods)

Applications of integration to – lengths of curves, areas of surfaces of revolution, Double and Triple integrals – change of order of integration, change of variables in integrals. Area enclosed by plane curves, volumes of solids.

UNIT-V: VECTOR CALCULUS (12 periods)

Vector differentiation: Gradient of a scalar field and Directional Derivative, Divergence and Curl of a Vector field

Line integrals: Line integrals independent of path – work done.

Surface area and Surface Integrals: Surface Area, Surface Integrals, Flux across a surface.

Green's Theorem: Green's Theorem (without proof)- verification- applications

Gauss Divergence Theorem and Stoke's Theorem: Gauss Divergence theorem (without proof), Stokes's Theorem (without proof) –verifications and applications.

Total no. of periods: 45

TEXT BOOK:

1. T.K.V. Iyengar, B. Krishna Gandhi,S.Ranganatham and M.V.S.S.N. Prasad, ***Engineering Mathematics, Vol-1***, S. Chand &Company, 13/e, 2014

REFERENCE BOOKS:

1. Grewal, B.S., ***Higher engineering mathematics***,Khanna publishers, Delhi, 42/e. 2012.
2. Kreyszig, E., ***Advanced Engineering Mathematics***,John Wiley and Sons, Inc.,9/e.2012.

I B. Tech. - I Semester

(16BT10501) **PROGRAMMING IN C**

(Common to all Branches)

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

PRE-REQUISITES: NIL

COURSE DESCRIPTION:

Program design; Operators and Expressions; Data Input and Output; Control Statements; Functions; Arrays; Strings; Pointers; Structures & Unions and File handling Techniques;

COURSE OUTCOMES:

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

CO1: Demonstrate knowledge in:
- o Elements of C Language
- o Selection and Repetition statements.
- o Arrays, Strings and Functional statements.
- o Derived data types, Files and Pointers

CO2: Analyze complex engineering problems to develop suitable solutions

CO3: Design algorithms for specified engineering problems

CO4: Use appropriate 'C' language constructs for solving engineering problems

CO5: Write programs using 'C' language to implement algorithms

DETAILED SYLLABUS:

UNIT I – INTRODUCTION TO C PROGRAMMING, OPERATORS & EXPRESSIONS (08 periods)

Introduction to C Programming: The C Character set, Writing First Program of C, Identifiers and Keywords, Data types, Constants, Variables and Arrays, Declarations, Expressions, Statements and Symbolic Constants.

Operators and Expressions: Arithmetic Operators, Unary Operators, Relational and Logical Operators, Assignment Operators, the Conditional Operators.

UNIT II – DATA INPUT AND OUTPUT & CONTROL STATEMENTS (08 periods)

Data Input and Output: Single Character Input and Output, Input Data & Output data, The gets and puts Function.

Control Statements: Branching: The if-else Statement, Looping: The while Statement, More Looping: The do-while Statement, Still More Looping: The for Statement, Nested Control Statement, The switch Statement, The break & continue Statements, The goto Statement.

UNIT III – FUNCTIONS, PROGRAM STRUCTURES & ARRAYS (11 p*eriods*)

Functions: A Brief Overview, Defining a Function, Accessing a Function, Function Prototypes, Parsing Argument to a Function, Recursion.

Program Structure: Storage Classes, Automatic Variables, External (Global) Variables, Static Variables, Multi file Programs,

Arrays: Defining an Array, Processing an Array, Processing Array to function, Multidimensional Arrays. Linear search, Binary search, Fibonacci search, Bubble sort and Insertion sort

UNIT IV – STRINGS & POINTERS (09 periods)

Strings: Defining a String, NULL Character, Initialization of Strings, Reading and Writing a String, Processing a Strings, Character Arithmetic, Searching and Sorting of Strings, Library Functions for Strings.

Pointers: Pointer Declaration, Passing Pointers to a Function, Pointers and One-dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers.

UNIT V – STRUCTURES AND UNIONS & FILE HANDLING (09 periods)

Structures and Unions: Defining a Structure, Processing a Structure, User-Defined Data types (typedef), Structures and Pointers, Passing Structures to Function, Self –Referential Structures, Unions

File Handling: Files introduction, Opening and Closing a Data File, Reading and Writing a Data File, Processing a Data File, Unformatted Data File, Concept of Binary Files, Accessing the File Randomly.

Total Periods: *45*

TEXT BOOK:

1. Byron Gottfried and Jitender Kumar C "*Programming with C*," Third Edition, McGraw Hill Education (India) Pvt, Ltd, New Delhi, 2016.

REFERENCE BOOKS:

1. PradipDey and Manas Ghosh, "*Programming in C",* Second Edition, Oxford University Press, NewDelhi, 2007.
2. E. Balagurusamy, "*Programming in C",* Seventh Edition, Mc Graw Hill Education (India) Pvt, Ltd, New Delhi, 2014.

I B. Tech. - I Semester

(16BT1HS31) ENGLISH LANGUAGE LAB

(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: English at Intermediate or Equivalent Level

COURSE DESCRIPTION: Phonetics; Vocabulary Building; Functional Grammar; Just a Minute; Elocution/Impromptu; Giving Directions/ Conversation Starters; Role Play; Public Speaking; Describing People, Places, Objects and Events; Reading Comprehension; Listening Comprehension; Information Transfer.

COURSE OUTCOMES:

On successful completion of this course the students will be able to

CO1. Demonstrate knowledge in
- a. Phonetics
- b. Information Transfer

CO2. Analyze the situations in professional context by using
- a. Vocabulary
- b. Grammar

CO3. Design and develop functional skills for professional practice.

CO4. Apply the techniques of Listening and Reading skills to comprehend Listening and Reading comprehension.

CO5. Function effectively as an individual and as a member in diverse teams through
- a. Extempore talk and
- b. Role Play

CO6. Communicate effectively in public speaking in formal and informal situations.

CO7. Recognize the need to engage in lifelong learning to upgrade competence of knowledge and communication.

DETAILED SYLLABUS:

LIST OF EXERCISES:

1. Phonetics
2. Vocabulary Building
3. Functional Grammar
4. Just a Minute
5. Elocution/Impromptu
6. Giving Directions/Conversation Starters

7. Role Play
8. Public Speaking
9. Describing People, Places, Objects and Events.
10. Reading Comprehension
11. Listening Comprehension
12. Information Transfer

Total Lab Slots: 10

TEXT BOOK:

1. Department Lab Manual

REFERENCE BOOKS:

1. D. Sudha Rani, *A Manual for English Language Laboratories*, Pearson Education.
2. D. Sudha Rani, *Advanced Communication Skills Laboratory Manual*, Pearson Education.
3. R. Manivannan and G. Immanuel, *Communication Skills Laboratory*, VK Publications, Sivakasi, 2013
4. Nira Kumar*, English Language Laboratories*, PHI Learning Pvt. Ltd., New Delhi, 2011.

SUGGESTED SOFTWARE:

1. ETNL Language Lab Software Version 4.0
2. GEMS – Globarena E- Mentoring System.
3. Speech Solutions.
4. English Pronunciation Dictionary by Daniel Jones.
5. Learn to Speak English 8.1, The Learning Company – 4 CDs.
6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
8. Dorling Kindersley Series - Grammar.
9. Language in Use 1, 2 & 3.
10. Cambridge Advanced Learner's Dictionary - 3rd Edition.
11. Centronix – Phonetics.
12. Let's Talk English, Regional Institute of English South India.
13. The Ultimate English Tutor.

I-B. Tech- I Semester

(16BT1BS31): ENGINEERING CHEMISTRY LAB

(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	0	0	3	2

PRE REQUISITE: Intermediate/Senior Secondary Chemistry

COURSE DESCRIPTION: Estimation of hardness, alkalinity, dissolved oxygen of water samples and estimation of Iron by volumetric methods, determination of effect of P^H on rate of corrosion, measurement of viscosity of lubricants; Instrumental methods like potentiometer, conductivity meter, P^H meter and colorimeter; synthesis of Polymers and Nano materials.

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

CO1: Acquire basic Knowledge about the volumetric analysis and synthesis of materials used for engineering applications.

CO2: Acquire analytical skills in the estimation of hardness of water, alkalinity of water, dissolved oxygen in water and estimation of Iron through wet laboratory methods.

CO3: Develop designing skills for the synthesis of polymers and Nanomaterials.

CO4: Acquire skills to use instrumental techniques for the determination of Electrical conductance of electrolytes, EMF of a cell, PH of a solution, determination of viscosity of lubricants and estimation of iron in cement.

CO5: Provide solutions for environmental issues through determination of quality of water.

List of Experiments:

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

1. Estimation of Hardness of water by EDTA method.
2. Estimation of alkalinity of Water.
3. Estimation of Dissolved Oxygen in water.
4. Estimation of Ferrous Iron by Dichrometry.
5. Preparation of Novalac Resin.
6. Synthesis of Nano metal-oxide using sol– gel process.
7. Conductometric titration of strong acid Vs strong base
8. Estimation of Ferrous ion by Potentiometry.
9. Determination of amount of corrosion of metals in different medium
10. Measurement of viscosity of lubricants by Ostwald viscometer.
11. Determination of P^H of a given solution by P^H metry.
12. Estimation of Ferric iron in cement by Colorimetric method.

Total Time Slots: 12

I B. Tech. - I Semester

(16BT10331) COMPUTER AIDED ENGINEERING DRAWING

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	6	3

PRE-REQUISITES: *None*

COURSE DESCRIPTION:

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

COURSE OUTCOMES:

After completion of the course, a successful student is able to:

- CO1: Understand, write and read the language of engineering drawing in industry through International System of Standards.
- CO2: Develop the imagination and mental visualization ability for interpreting the geometrical details of engineering objects.
- CO3: Produce different views and projection in drawing.
- CO4: Use modern CAD software for design and drafting of drawings.
- CO5: Create multi-view drawings suitable for presentation to Engineering community.
- CO6: Introduce and communicate universally accepted conventions and symbols for their usage in technical drawing.

DETAILED SYLLABUS:

UNIT : I - BASICS OF ENGINEERING DRAWING PRACTICE, GEOMETRICAL CONSTRUCTIONS, CONICS AND SPECIAL CURVES (18 periods)

Introduction, drawing instruments and its uses, sheet layout, BIS conventions, lines, lettering and dimensioning practices. Geometrical constructions: Construction of regular polygons: Pentagon, Hexagon, Heptagon and Octagon. Conic sections**:** Introduction, construction of ellipse: rectangular method, eccentricity method. Construction of parabola: rectangular method, eccentricity method. Construction of hyperbola: eccentricity method. Special curves*:* cycloid, involute.

UNIT: II – INTRODUCTION TO COMPUTER AIDED SKETCHING (18 periods)

Computer screen, layout of the software, creation of 2D/3D environment, selection of drawing size and scale, Standard tool bar/menus, Coordinate system, description of most commonly used toolbars, navigational tools: commands and creation of lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity.

UNIT: III – PROJECTION OF POINTS, STRAIGHT LINES AND PLANES (21 periods)

Introduction, method of projection, planes of projection, reference line and notations. Projection of points: Points in all the four quadrants. Projection of straight lines**:** lines inclined to HP / VP plane, inclined to both HP and VP planes (straight lines are assumed to be in first quadrant only)**.** Projection of planes**:** projection of triangle, square, rectangle, rhombus, pentagon, hexagon and circular plane for the condition inclined to HP / VP by change of position method.

UNIT IV –PROJECTION OF SOLIDS AND SECTION OF SOLIDS (21 Periods)

Projections of Solids: Introduction, projection of solids: prisms, pyramids, cylinders and cones with axis perpendicular to VP/HP and axis inclined to VP/HP only. Sections of solids**:** Introduction, Cutting plane, sectional views of right regular solids resting with base on HP: prisms, pyramids, cylinder and cone and true shapes of the sections.

UNIT V –ORTHOGRAPHIC AND ISOMETRIC PROJECTIONS AND DEVELOPMENT OF SURFACES (22 periods)

Orthographic projection: simple exercises. Isometric projection: Simple exercises.

Development of surfaces: prisms, pyramids, cylinders, cone and miscellaneous surfaces

Total Periods: *100*

Note: *Student shall practice Unit-I using sketch book only and remaining units using sketch book first and later CAD package.*

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 Bhat & V M Panchal, Engineering Drawing, Charotar Publishing House, Gujarat, 51st edition, 2013.

REFERENCE BOOKS:

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, 4th Edition, 2012.
3. T.Jeyapoovan, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House, 3rd Edition, 2010.
4. Jolhe, Engineering Drawing, Tata McGraw Hill Education Private Limited, 1st Edition, 2007.
5. Basant Aggarwal, Engineering Drawing, Tata McGraw Hill Education Private Limited, 1st Edition, 2008.

I B. Tech. - I Semester

(16BT10531) **PROGRAMMING IN C LAB**

(Common to all Branches)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES:-

A course on Programming in C

COURSE DESCRIPTION:

Hands on practice in developing and executing simple programs using C Programming constructs– Conditional statements, Loops, Arrays, Strings, Functions, Structures, Pointers and Functions.

COURSE OUTCOMES:

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

CO1. Demonstrate practical knowledge of using C language constructs:
. Selection and Repetition statements.
. Arrays, Strings and Functional statements.
. Derived data types, Files and Pointers

CO2. Analyze problems to develop suitable algorithmic solutions

CO3. Design Solutions for specified engineering problems

CO4. Use appropriate 'C' language constructs for solving engineering problems

CO5. Implement and execute programs using 'C' language

CO6. Document programs and communicate effectively while conducting Professional transactions.

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 + 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 = P T R / 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 3 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. A character is entered through keyboard. Write a program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol. The following table shows the range of ASCII values for various characters.

	Characters ASCII values
A - Z	65 - 90
a - z	97- 122
0 - 9	48 - 57
Special Symbols	0 - 47, 58 - 64, 91- 96, 123 - 127

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

b. 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.

5. a. 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)

b. Write a program to find the grace marks for a student using switch. The user should enter the class obtained by the student and the number of subjects he has failed in. Use the following rules:

i. If the student gets first class and the number of subjects failed is >3, then no grace marks are awarded. If the number of subjects failed is less than or equal to '3' then the grace is 5 marks per subject.

ii. If the student gets second class and the number of subjects failed in is >2, then no grace marks are awarded. If the number of subjects failed in less than or equal to '3' then the grace is 4 marks per subject.

iii. If the student gets third class and the number of subjects failed in is >1, then no grace marks are awarded. If the number of subjects failed in is equal to '1' then the grace is 5 marks per subject.

6. 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.

Write a program to generate all the prime numbers between 1 and N, where N is a value supplied by the user.

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

b. Write a program to perform the following:

i. Addition of two matrices.

ii. Multiplication of two matrices.

d. Write a program to count the number of lines, words and characters in a given text.

9. a. Write a program to read list of student names and perform the following operations using functions.

i. to print list of names

ii. to sort them in ascending order

iii. to print the list after sorting.

b. Write a menu driven program to read list of student names and perform the following operations using array of character pointers.

i. to insert a student name

ii. to delete a name

iii. to print the name

10. Write a program that uses functions to perform the following operations:

i. Reading a complex number

ii. Writing a complex number

iii. Addition of two complex numbers

iv. Multiplication of two complex numbers

(**Note:** Represent complex number using a structure.)

11. a. 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.100.consolidated.

b. Define a structure to store employee's data with the following specifications:

Employee-Number, Employee-Name, Basic pay, Date of Joining

i. Write a function to store 10 employee details.

ii. Write a function to implement the following rules while revising the basic pay.

If Basic pay<=Rs.5000 then increase it by 15%.

If Basic pay> Rs.5000 and <=Rs.25000 then it increase by 10%.

If Basic pay>Rs.25000 then there is no change in basic pay.

Write a function to print the details of employees who have completed 20 years of service from the date of joining.

12. a. Write a program which copies one 'text file' to another 'text file'.

b. Write a program to reverse the first N characters of a given text file.

Note: The file name and N are specified through command line.

13. Write a program to print the output by giving the Customer_ID as an input.

REFERENCE BOOKS:

1. Byron Gottfried and Jitender Kumar C, *Programming with C*, 3rd edition, McGraw Hill Education(India) Pvt. ltd, New Delhi, 2016.
2. Pradip Dey and Manas Ghosh, *Programming in C*, 2nd Edition, Oxford University Press, New Delhi, 2007.

I B. Tech. - II Semester

(16BT1BS02) ENGINEERING PHYSICS

(Common to all branches)

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

PRE-REQUISITE: Intermediate / Senior Secondary Physics

COURSE DESCRIPTION: Lasers; optical fibers; principles of quantum mechanics; band theory of solids; semiconductors; dielectric properties of materials; acoustics of buildings; superconductors; crystallography and nanomaterials.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1. Acquire basic knowledge of lasers, optical fibers, quantum mechanics, dielectrics, semiconductors, and superconductors, acoustic of buildings, crystallography and nanomaterials.

CO2. Analyze the construction and working of various laser systems, semiconductor devices, various types of optical fibers and its communication system and nano materials properties.

CO3. Gain skills in designing lasers, optical fiber cable, semiconductor devices, acoustically good halls and nanomaterials.

CO4. Develop problem solving skills in engineering context.

CO5. Use relevant techniques for assessing ball milling, pulsed laser deposition, p-n junction and Laser.

DETAILED SYLLABUS:

UNIT I: LASERS AND FIBER OPTICS (11 periods)

Lasers: Introduction, characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein's coefficients – condition for amplification, population inversion, Nd:YAG laser, Helium-Neon laser, semiconductor laser and applications of lasers.

Fiber optics: Introduction, principle of optical fiber, acceptance angle, acceptance cone and numerical aperture, classification of optical fibers, optical fiber communication system and applications of optical fibers.

UNIT II: PRINCIPLES OF QUANTUM MECHANICS AND BAND THEORY OF SOLIDS (07 periods)

Principles of Quantum Mechanics: Introduction, de-Broglie's hypothesis, Schrödinger's one dimensional wave equation (time independent), significance of wave function, particle in a one dimensional potential box, Fermi-Dirac distribution and effect of temperature (qualitative treatment).

Band Theory of Solids: Electron in a periodic potential, Kronig-Penney model (qualitative treatment), origin of energy bands formation in solids, distinction between conductors, semiconductors and insulators based on band theory.

UNIT III: SEMICONDUCTORS AND DIELECTRIC PROPERTIES OF MATERIALS (13 periods)

Semiconductors: Introduction, types of semiconductors, intrinsic carrier concentration, electrical conductivity in semiconductors, drift and diffusion currents, Einstein's relation, Hall effect and its applications, direct and indirect band gap semiconductors, p-n junction, energy band diagram of p-n diode, LED, photo diode and Solar cell.

Dielectric Properties of Materials: Introduction, dielectric constant, electronic, ionic and orientation polarizations (qualitative treatment), local field, frequency dependence of polarizability (qualitative treatment), ferroelectricity.

UNIT IV: ACOUSTICS OF BUILDINGS AND SUPERCONDUCTIVITY (07 periods)

Acoustics of Buildings: Introduction, basic requirement of acoustically good hall, reverberation and time of reverberation, Sabine's formula for reverberation time (qualitative treatment), absorption coefficient of sound and its measurement, factors affecting the architectural acoustics and their remedies.

Superconductivity: Introduction, General properties - Meissner effect, penetration depth, Type-I and Type-II superconductors, flux quantization, Josephson effects, BCS theory (qualitative treatment), applications of superconductors.

UNIT V: CRYSTALLOGRAPHY AND NANOMATERIALS (07 periods)

Crystallography: Introduction, crystal planes, crystal directions and Miller indices, separation between successive (hkl) planes, X-ray diffraction by crystal planes, Bragg's law- powder method.

Nanomaterials: Introduction, principles of nanomaterials, properties of nanomaterials, synthesis of nanomaterials by ball milling and pulsed laser deposition and applications of nanomaterials.

Total Periods: 45

TEXT BOOK:

1. P. K. Palaniswamy, *Engineering Physics*, Scitech Publications India Private Limited, 2nd Edition, 2009

REFERENCE BOOKS:

1. Dr. S. Mani Naidu, *Engineering Physics*, Pearson Education, 1st Edition, 2013.
2. M.N. Avadhanulu,P.G.Kshirsagar, *A textbook of Engineering Physics*, S.Chand & Company Ltd. Revised edition 2014.
3. K. Thyagarajan, *Engineering Physics-I*, McGraw-Hill Education (India) Pvt.Ltd. 2015

I B. Tech. - II Semester

(16BT2BS01) TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to all Branches)

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

PRE REQUISITE: Intermediate /Senior secondary mathematics

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms; partial differential equations.

COURSE OUTCOMES:

After completion of the course a successful student is able to

CO1: Acquire basic knowledge in
- (a) Fourier series and Fourier transforms
- (b) Fourier integrals
- (c) Laplace transforms and their applications
- (d) z- transforms and their applications
- (e) solving partial differential equations

CO2: Develop skills in analyzing the
- (a) Properties of Fourier series for a given function
- (b) Partial differential equations through different evaluation methods
- (c) Difference equations through z – transforms
- (d) Engineering systems and processes involving wave forms and heat transfer

CO3: Develop skills in designing mathematical models for
- (a) Problems involving heat transfer and wave forms
- (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO4: Develop analytical skills in solving the problems involving
- (a) Fourier series and Fourier transforms
- (b) Laplace transforms
- (c) Z-transforms and difference equations
- (d) Heat transfer and wave motion

CO5: Use relevant transformation techniques for
- (a) Obtaining Fourier transforms for different types of functions
- (b) Laplace transforms
- (c) Z- transforms
- (d) Partial differential equations

DETAILED SYLLABUS

UNIT- I : FOURIER SERIES (7 periods)

Fourier series: Determination of Fourier coefficients, convergence of Fourier series (Dirichlet's conditions), Fourier series of even and odd functions, Half-range Fourier sine and cosine expansions.

UNIT- II: FOURIER INTEGRALS AND FOURIER TRANSFORMS (8 periods)

Fourier integral theorem (statement only), Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms –properties, Inverse transform and finite Fourier transforms.

UNIT-III: LAPLACE TRANSFORMS (12 periods)

Laplace transforms of standard functions. Properties of Laplace transforms. First and second shifting Theorems. Laplace transforms of derivatives and integrals. Inverse transforms. Convolution theorem (without proof), inverse Laplace transforms by convolution theorem. Laplace transform of periodic functions, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT-IV: Z- TRANSFORMS (9 periods)

Z – transforms, inverse Z– transforms, damping rule, shifting rule, initial and final value theorems. Convolution theorem (without proof), solution of difference equations by Z– transforms.

UNIT – V: PARTIAL DIFFERENTIAL EQUATIONS (9 periods)

Formation of Partial differential equations – Solutions of first order linear equations by method of grouping. First and second order equations by method of separation of variables – Solutions of one dimensional Wave equation, Heat equation.

Total no. of periods: 45

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi,S.Ranganadham and M.V.S.S.N. Prasad,***Engineering Mathematics, vol-1***, S. Chand & Company 13/e,2014.
2. T.K.V. Iyenger, B. Krishna Gandhi, S.Ranganadham and M.V.S.S.N.Prasad, ***Mathematical Methods***,S.Chand and Company, 8/e,2013.

REFERENCE BOOKS:

1. Grewal, B.S., ***Higher Engineering Mathematics***,Khanna publishers, Delhi, 42/e,2012.
2. Kreyszig, E., ***Advanced Engineering Mathematics***,John Wiley and Sons, Inc.,9/e,2013.

I B. Tech. - II Semester
(16BT20101) BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY
(Civil Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITE: Engineering Chemistry

COURSE DESCRIPTION: Stones; Bricks; Tiles; Timber; Lime; Cement; Miscellaneous materials in construction; Masonry and Foundations; Building Components; Finishings; Shoring; Scaffolding and Formwork.

COURSE OUTCOMES:

On successful completion of this course the students will be able to

CO1. Identify building materials, building components and construction techniques.

CO2. Characterize building materials and construction techniques.

CO3. Recommend proper building materials and construction techniques.

CO4. Develop new construction materials and construction techniques.

CO5. Use modern tools and techniques in construction practice.

CO6. Ensure health and safety in construction practice.

CO7. Encourage sustainable and environmental friendly building materials and construction techniques.

CO8. Maintain ethical standards for quality in construction.

CO9. Promote cost effective building materials and construction techniques.

CO10. Engage in continuous learning of latest construction materials and techniques.

DETAILED SYLLABUS:

UNIT I: STONES, BRICKS, TILES AND TIMBER

(09 periods)

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

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

UNIT II: LIME, CEMENT AND CEMENT CONCRETE

(09 periods)

Lime: Ingredients of lime, Constituents of lime stone, Classification of lime, Manufacture of lime.

Cement and Cement Concrete: Ingredients of cement, Manufacture of OPC, Types of cement and their properties, Various field and laboratory tests on cement, Ingredients of cement concrete, Grades of concrete and their importance.

UNIT III: MISCELENIOUS MATERIALS FOR CONSTRUCTION

(08 periods)

Use of Materials like galvanized iron, steel, aluminum, gypsum, copper, glass, bituminous materials, rubber, fiber-reinforced plastics, ceramic products, asbestos and their quality. **UNIT IV: FOUNDATIONS, MASONRY AND BUILDING COMPONENTS**

(10 periods)

Foundations and Masonry: Foundations, Shallow foundations, Spread, combined, strap and mat footings, Types of masonry, English and Flemish bonds, Rubble and Ashlar masonry, Cavity walls, Partition walls.

Building Components: Beams, Columns, Lintels, Arches, Vaults, Stair Cases, Types of floors: Concrete, Mosaic and 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 V: FINISHINGS, SHORING, SCAFFOLDING AND FORM WORK

(09 periods)

Finishings: Damp Proofing, water proofing, Termite proofing, Fire proof materials, 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.

Total Periods: 45

TEXT BOOKS:

1. S. K. Duggal, *Building Materials,* New Age International Publishers, 4th Edition, 2010.
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Building Construction*, 10th Edition, Laxmi Publications (P) Ltd., 2010.

REFERENCE BOOKS:

1. R. K. Rajput, *Engineering Materials*, 3rd Edition, S. Chand and Company Ltd., New Delhi, 2006.
2. S. P. Arora and S. P. Bindra, *Building Construction,* Dhanpat Rai and Sons, 2010.
3. Varghese P. C., Building Construction, PHI Learning Pvt. Ltd., 2008.
4. K. K. Chitkara, *Construction Project Management: Planning Scheduling and Controlling,* 2nd Edition, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2009.

I B. Tech. - II Semester

(16BT20102) ENGINEERING MECHANICS

(Common to CE & ME)

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

PRE-REQUISITES: Intermediate Mathematics and Physics.

COURSE DESCRIPTIONS: statics of particles and rigid bodies; support reactions; analysis of perfect frames; friction; centroid, centre of gravity and moment of inertia; kinematics and kinetics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Apply the knowledge of engineering mechanics fundamentals to the solutions of basic engineering problems.

CO2: Analyze

- Multi-body systems under equilibrium and dynamic conditions.
- Systems involving dry friction and computing the efficiency of the system of forces in frames under suitable assumptions.
- Sectional properties of surfaces and solids.

CO3: Design sustainable solutions to complex engineering problems using first principles of engineering mechanics.

CO4: Exercise awareness to assess the safety of system related to engineering mechanics.

CO5: Communicate effectively engineering and allied information through free body diagram.

CO6: Sustain interest in engineering mechanics to upgrade knowledge and skills through self learning concepts in mechanics.

Detailed Syllabus:

UNIT–I: STATICS OF PARTICLES (10 Periods)

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.

UNIT–II: STATICS OF RIGID BODIES (14 Periods)

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–III: FRICTION (10 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–IV: CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA (12 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–V: KINEMATICS AND KINETICS (14 Periods)

Kinematics of Particles

Rectilinear and Curvilinear motion, Velocity, Acceleration, Motion of a projectile, Relative motion.

Kinetics of Particles and Rigid Bodies

Kinetics of rectilinear motion, Newton's laws of motion, D'Alembert's principle, Work-energy method, Impulse-momentum equation, Kinetics of circular motion, Rotation.

Total Periods: 60

TEXT BOOKS:

1. S. S. Bhavikatti and K. G. Rajashekarappa, **Engineering Mechanics**, New Age International (P) Ltd., 3rd Edition, 2009.
2. J. L. Meriam and L. G. Kraige**, Engineering Mechanics: Statics** (Vol. 1), **Dynamics** (Vol. 2), John Wiley & Sons Ltd., 5th Edition, 2008.

REFERENCE BOOKS:

1. Arthur P. Boresi and Richard J. Schmidt, **Engineering Mechanics - Statics and Dynamics**, Cengage Learning, 1st edition, Indian Edition, 2008.
2. S. Rajasekaran and G. Sankarasubramanian, **Engineering Mechanics – Statics and Dynamics**, Vikas Publishing House Pvt. Ltd., 3rd edition, 2009.
3. K. Vijaya Kumar Reddy and J. Suresh Kumar, **Singer's Engineering Mechanics - Statics and Dynamics**, BS Publications, 3rd edition, 2010.
4. S. Timoshenko, D. H. Young and J. V. Rao, **Engineering Mechanics,** Tata McGraw-Hill Education Pvt. Ltd., Revised 4th edition, Special Indian Edition, 2007.

I B. Tech. - II Semester
(16BT20241) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to CE & ME)

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

PRE-REQUISITES: Physics and Mathematics

COURSE DESCRIPTION: Basics of electrical DC and AC circuits; principle of operation and applications of DC machines, transformers, and induction motors; Transducers and measuring instruments; rectifier devices; bipolar transistors and its characteristics.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Demonstrate knowledge on
- Electrical and electronic circuits.
- Construction and operation of electrical machines, electrical and electronic instruments.

CO2: Analyze various electrical & electronic circuits and different transducers.

CO3: Evaluate the electrical and electronic circuit parameters and performance of electrical machines.

CO4: Select and apply various machines and transducers.

Detailed Syllabus:

UNIT-I: BASICS OF ELECTRICAL ENGINEERING **(10 Periods)**

Sources of electricity, basic circuit components, electric field, electric current, potential and potential difference, EMF, electric power, Ohm's law, node, path, loop, branch, resistive networks, inductive networks, capacitive networks, Kirchhoff's laws, series-parallel circuits, nodal analysis, mesh analysis, star-delta and delta-star transformations – problems.

UNIT–II: AC FUNDAMENTALS **(9 Periods)**

Production of alternating voltage, phase and phase difference, phasor representation of alternating quantities, behavior of AC series, parallel and series-parallel circuits, power in AC circuit - problems.

UNIT–III: DC AND AC MACHINES **(10 Periods)**

DC Machines: Construction and working of a DC Generator and DC motor and their types, EMF equation of a DC generator, torque equation

of a DC motor, applications of DC generators and DC motors - problems.
Transformers: Construction and working of a single phase transformer, EMF Equation.
AC Machines: Construction and working of a three phase induction motor, applications of three phase induction motors.

UNIT–IV: TRANSDUCERS AND MEASURING INSTRUMENTS (8 Periods)

Transducers, Basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers, Piezoelectric and thermocouple, Load cells, Data loggers, Data acquisition system (overview and concept only), Digital voltmeters, Digital ammeter, Digital multi-meters (elementary concepts only).

UNIT–V: RECTIFIER CIRCUITS AND BIPOLAR JUNCTION TRANSISTORS (8 Periods)

Rectifier Circuits: DC voltage and current, Peak Inverse Voltage (PIV), ripple factor, efficiency and regulation of half wave and full wave rectifiers.
Bipolar Junction Transistors: Formation of PNP / NPN junctions, Transistor as an amplifier, need for biasing, single stage CE amplifier.

Total Periods: 45

TEXT BOOKS

1. V.K. Mehta and Rohit Mehta, **Principles of Electrical and Electronics Engineering**, 2nd edition, S.Chand & Sons, New Delhi, 2007.
2. M.S. Naidu and S. Kamakshaiah, **Introduction to Electrical Engineering**, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

REFERENCE BOOKS

1. Theraja B.L & Theraja A.K, **A Text Book of Electrical Technology**, Vol-1, S.Chand, New Delhi, 2009.
2. A. K. Sawhney, **Electrical & Electronics Measurement and Instrumentation**, Dhanpat Rai & Co.(P) Ltd, New Delhi, 15th edition, 2014.
3. K. Lal Kishore, **Electronic Devices and Circuits**, BS Publications, Hyderabad, 3rd edition, 2008.

I B. Tech. - II Semester

(16BT1BS32) **ENGINEERING PHYSICS LAB**

(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Intermediate / senior secondary Physics.

COURSE DESCRIPTION:

Characteristics of p-n junction diode, Photodiode, LED, and semiconductor laser diode. Experimental determination of carrier concentration and energy gap of a semiconductor material, wave length of a laser source, size of fine particle, numerical aperture and acceptance angle of optical fiber. Determination of frequency of electrically vibrating tuning fork and A.C source using A.C sonometer, magnetic field along axial line of a current carrying coil and rigidity modulus of material of a wire using torsional pendulum.

COURSE OUTCOMES:

After completion of the course, a successful student will be able to:

CO1: Acquire basic knowledge about semiconductor materials, magnetic materials and lasers.

CO2: Acquire analytical skills in the estimation of carrier concentration of semiconductor materials and characterization of p-n junction.

CO3: Develop skills in designing electronic circuits using semiconductor components.

CO4: Acquire skills to use instrumental techniques in A.C sonometer and Melde's experiment.

CO5: Apply diffraction techniques for determination of size of tiny particles and wave length of lasers.

ENGINEERING PHYSICS LAB

Conduct a minimum of any **Ten** of the following experiments.

1. Determination of wavelength of a laser source using Diffraction Grating.
2. Determination of particle size by using a laser source.
3. Determination of Numerical aperture and acceptance angle of an optical fiber.
4. Melde's experiment - transverse & longitudinal modes.
5. Magnetic field along the axis of a current carrying coil- Stewart and Gee's method.
6. Calculation of A.C frequency using sonometer.
7. I-V Characteristics of a p-n Junction diode.
8. Energy gap of a material of a p-n Junction.
9. Characteristics of LED source.
10. Characteristics of Photo diode.
11. Hall Effect.
12. Determination of rigidity modulus of the material of the wire using torsional pendulum.

I B. Tech. - II Semester

(16BT20131) BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY LAB

(Civil Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITE: Building Materials and Construction Technology

COURSE DESCRIPTION: Exercises on Masonry; Bar bending; Painting; House wiring; Shuttering and scaffolding; Plumbing and sanitation; Building materials; Construction equipment.

COURSE OUTCOMES:

After completion of this course, a successful student will be able to:

CO1. Identify building materials, building components and construction techniques.

CO2. Characterize building materials and construction techniques.

CO3. Recommend proper building materials and construction techniques.

CO4. Develop new construction materials and construction techniques.

CO5. Use modern tools and techniques in construction practice.

CO6. Ensure health and safety in construction practice.

CO7. Encourage sustainable and environmental friendly building materials and construction techniques.

CO8. Maintain ethical standards for quality in construction.

CO9. Function effectively as an individual, and as a member or leader in teams.

CO10. Comprehend and write effective reports on building materials and construction techniques.

CO11. Promote cost effective building materials and construction techniques.

CO12. Engage in continuous learning of latest construction materials and techniques.

DETAILED SYLLABUS:

LIST OF EXERCISES:

A) MASONRY

1. Internal masonry
2. External masonry
3. Brick work – English bond
4. Brick work – Flemish bond

B) REINFORCEMENT

5. Demonstration of reinforcement skeleton for foundations, columns, beams, slabs, lintels, arches, vaults and stair cases.

C) BAR BENDING

6. Columns and beams
7. Slabs

D) PAINTING

8. External wall painting
9. Internal wall painting

E) HOUSE WIRING

10. 15 amps line
11. 5 amps line

F) SHUTTERING AND SCAFFOLDING

12. Shuttering for beams and slabs
13. Shuttering for columns and walls
14. Steel scaffolding
15. Single and double scaffolding

G) PLUMBING AND SANITATION

16. Single and double stack system including fittings and fixtures
17. Plumbing of water supply line with GI and PVC material including fittings and fixtures

H) BUILDING MATERIALS

18. Properties and identification of building materials
19. Market survey for building materials

I) CONSTRUCTION EQUIPMENT

20. Specifications and identification of construction equipment
21. Market survey for construction equipment

I B. Tech. - II Semester

(16BT20252) MATLAB Practice for Civil Engineers

(Civil Engineering)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	3	2

PRE-REQUISITE: Mathematics at Intermediate Level and Principles of Computer Programming.

COURSE DESCRIPTION: Exercises on MATLAB Basics; Arrays; Functions and Files; Programming Techniques; Plotting; Linear Algebraic Equations; Polynomials; Simulink.

COURSE OUTCOMES:

After successful completion of the course, student will be able to

CO1. Apply knowledge of MATLAB basics.
CO2. Carryout numerical computations and analysis.
CO3. Design solutions for engineering problems using MATLAB.
CO4. Develop solutions for complex civil engineering problems using MATLAB Programming and Simulation.
CO5. Use MATLAB Tool boxes for civil engineering applications.

DETAILED SYLLABUS:

LIST OF EXERCISES:

A) 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

B) CONTROL STRUCTURES

8. If, If ——Else If
9. While
10. For
11. Switch

C) MATRICES

12. Generation of Row/Column Vector
13. Generation of 2 Dimensional/Multidimensional Matrix
14. Arithmetic Operation on Arrays
15. Determination of Eigen Vector and Eigen Values of a Matrix

16. Determination of Rank of the Matrix

D) GRAPHICS

17. 2D Plot
18. 3D Plot
19. Mesh Plot and Surface Plots
20. Plotting of Wave Forms: Triangle, Square and Sine.

E) POLYNOMIALS

21. Determination of Roots of a Polynomial Equation
22. Arithmetic Operations on Polynomials
23. Least Square Curve Fitting
24. Interpolation

F) ALGEBRA, DIFFERENTIATION AND INTEGRATION

25. Determine the Solution of Linear and Non-Linear Equation
26. Determine the Solution for the First-Order and Higher-Order Differential Equations
27. Determine the Solution for Single Variable and Two Variable Integration
28. Determine the Summation of Infinite and Finite Series

G) SIMULINK

29. Basics of Simulink
30. Simulink Model to Solve an Equation
31. Simulink Model to Solve Support Reaction of a Beam

H) SOLVING ENGINEERING PROBLEMS USING MATLAB

32. Centroid
33. Support Reactions of a Beam
34. Projectile

I) DEMONSTRATION ON TOOLBOXES FOR SPECIFIC CIVIL ENGINEERING APPLICATIONS

TEXT BOOKS:

1. Raj Kumar Bansal, Ashok Goel, Manoj Kumar Sharma, "*MATLAB and its Applications in Engineering*", Pearson Education, 2012.
2. Rudra Pratap, "*Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers*", Oxford University Press, 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.

I B. Tech. - II Semester

(16BT20331) ENGINEERING WORKSHOP PRACTICE

(Common to CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	--	--	3	2

PRE-REQUISITES: None

COURSE DESCRIPTION: Knowledge on various workshop hand and power tools; utilization in different manufacturing trades such as carpentry, fitting, house wiring, sheet metal forming, foundry; overview of metal cutting processes, plumbing and welding through live demonstrations.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- **CO1:** Acquire knowledge on utilization of hand and power tools for engineering applications.
- **CO2:** Employ analytical skills for the production of a component for real time applications.
- **CO3:** Design and model different prototypes in the carpentry, fitting and sheet metal operations.
- **CO4:** Comprehend the usage of modern power tools.
- **CO5:** Abide by workshop safety regulations and adopt environmentally safe practices.
- **CO6:** Engage in self study for solving engineering related problems.

Detailed Syllabus:

1. **FITTING:** Introduction, types of fitting tools: holding tools, marking and measuring tools, cutting tools, finishing tools and miscellaneous tools, fitting operations, safety precautions, care and maintenance of hand tools.

   EXERCISES:
   - Square Mating
   - V- Mating
   - Half Round Mating
   - Dovetail Mating.

2. **CARPENTRY:** Introduction, types of wood, carpentry tools, wood working techniques, types of joints, safety precautions, care and maintenance of tools.

   EXERCISES:

   - Cross lap Joint
   - Briddle Joint
   - Dovetail Joint
   - Mortise and Tenon Joint.

3. **SHEET METAL FORMING:** Introduction, sheet metal materials, hand tools, sheet metal fabrication, safety and precautions.

   EXERCISES:

   - Fabrication of Tray
   - Fabrication of Square vessel
   - Fabrication of Funnel
   - Fabrication of Cylinder

4. **WIRING**: Introduction, elements of wiring, wiring methods, earthing, electrical fittings and accessories, types of wires and colors, safety and precautions.

   EXERCISES:

   - One Lamp Controlled by one One- way Switch
   - Two Lamps Controlled by one One-Way Switch in series/ parallel
   - One Lamp Controlled by two Two- way Switches (Stair case wiring)
   - Tube Light Connection

5. **FOUNDRY:** Introduction, moulding sand, properties of moulding sand, types of patterns and pattern , materials, foundry tools, safety and precautions.

   EXERCISES:

   - Mould Preparation with single piece pattern (cube)
   - Mould Preparation with single piece pattern (stepped pulley)
   - Mould Preparation with Split piece Pattern (Tumble)
   - Mould Preparation with Split piece Pattern (pipe bent)

6. **THEMES FOR DEMONSTRATION:** Machine shop, Plumbing, Welding and Power Tools.

Note: Student shall perform any **Two** exercises from each trade.

Total Periods: 42

REFERENCE BOOKS:

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,** VRB Publishers Private Limited, 2009.

II B.Tech. – I Semester

(16BT3BS01) PROBABILITY DISTRIBUTIONS AND STATISTICAL METHODS

(Common to CSE, CSSE, IT, CE and ME)

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

PRE REQUISITES: Intermediate/senior secondary mathematics

COURSE DESCRIPTION: Random variables; mathematical expectations; probability distributions; correlation and regressions; statistical quality control; sampling distributions; tests for small and large samples and their significances.

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

CO1. Acquire basic knowledge in
- a) probability distributions, correlation and regressions
- b) statistical quality control and testing of hypotheses
- c) Simple linear regression
- d) Tests of significance for small and large samples

CO2. Develop skills for analyzing the data with
- a) mathematical expectations for realistic results
- b) probability distributions for practical situations.
- c) control charts of statistical quality control
- d) correlation and regression concepts
- e) suitable tests of significance for practical situations.

CO3. Develop skills in designing
- a) probability distributions
- b) limitations of statistical quality control
- c) control charts,
- d) X, R, np, and c charts

CO4. Develop analytical skills for solving problems involving

a) Probability distributions, means, variances and standard deviations
b) statistical techniques employed for quality
c) sampling techniques for decision making
d) Tests of significances for small and large samples

CO5. Use relevant probability and statistical techniques for
a) Mathematical expectations of desired results
b) Fitting probability distributions for experimental data.
c) Quality control and testing of hypothesis.

DETAILED SYLLABUS

UNIT - I: RANDOM VARIABLE AND MATHEMATICAL EXPECTATIONS (09 Periods)

Random Variables: Discrete and Continuous random variables, Distribution function of random variable, Properties, Probability mass function, Probability density function, Mathematical expectation, Properties of Mathematical expectations, Mean and Variance.

UNIT - II: PROBABILITY DISTRIBUTIONS (09 Periods)

Discrete Distributions: Binomial and Poisson Distributions, Mean, variance and standard deviations.

Continuous Distributions: Normal Distribution, Mean, Variance and properties

UNIT - III: CORRELATION, REGRESSION AND STATISTICAL QUALITY CONTROL (09 Periods)

Definition of correlation, correlation coefficient, Rank correlation. Simple linear regression, regression lines and properties.

Introduction, advantages and limitations of statistical quality control, Control charts, specification limits, $\overline{X}$, R, np and c charts.

UNIT - IV: SAMPLING DISTRIBUTIONS AND TEST OF SIGNIFICANCE FOR LARGE SAMPLES (09 Periods)

Population and Sample, Parameter and Statistic, Sampling Distribution of Statistic, Standard Error of Statistic, Null and Alternative Hypothesis, Type I and II errors, Level of Significance,

Critical region, Degrees of freedom.Tests of significance for proportions and means.

UNIT - V: TEST OF SIGNIFICANCE FOR SMALL SAMPLES
(09 Periods)

Student's t-test: single mean, difference of means, F-test for equality of population variance, Chi-Square Test for Goodness of fit, contingency table, Chi-Square Test for Independence of Attributes.

Total no. of Periods: 45

TEXT BOOKS:

1. T.K.V. Iyengar, B. Krishna Gandhi, S.Ranganatham and M.V.S.S.N. Prasad, *Probability and Statistics*, S. Chand & Company, 4/e, 2013.
2. S.P.Gupta, *Statistical Methods*, Sultan and Chand, New Delhi, 28/e, 2005.

REFERENCE BOOKS:

1. S.C.Gupta and V.K.Kapoor, *Fundamentals of Applied Statistics*, Sultan and Chand, New Delhi, 11/e, 2004.
2. ShahnazBathul, *A Text Book of Probability and Statistics*, RidgePublications, 2/e, 2007.

II B.Tech. – I Semester

(16BT3HS02) MANAGERIAL ECONOMICS AND PRINCIPLES OF ACCOUNTANCY

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

PRE REQUISITES: -

COURSE DESCRIPTION: Managerial Economics; Demand and Elasticity of Demand; Production Functions; Markets and Pricing Policies; Formation of different types of Business Organizations; Basic concepts of Accounting (Journal, Ledger and Trial balance); Trading Account, Profit and Loss Account and Balance sheet with simple adjustments; Computerized Accounting.

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

CO1. Acquire Knowledge in

a) Tools and concepts of Micro Economics.
b) Basic Principles and concepts of Accountancy.
c) Provides life skills for effective utilization of scarce resources.
d) Financial Accounting.
e) Significance of Economics and Accountancy

CO2. Develop skills in managerial decision making of an organization.
CO3. Apply the Economic theories i.e., Demand, Production, Cost, Markets and Price.
CO4. Develop effective communication in Business and Accounting transactions.
CO5. Ascertain the profitability and soundness of an organization.
CO6. Practice Financial Accounting

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO MANAGERIAL ECONOMICS, DEMAND ANALYSIS (09 Periods)

Definition, Nature and Scope of Managerial 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 **(09 Periods)**

Production Function: Isoquants and Isocosts – Input-output relationship - Law of returns. **Cost Concepts:** Total, Average and Marginal Cost **-** Fixed vs. Variable costs – Opportunity Costs Vs Outlay Costs– Separable Costs Vs Joint Costs, Urgent Costs Vs Postponable Costs- Avoidable Costs Vs Unavoidable Costs - **Break Even Analysis (BEA)** – Assumptions, Merits and demerits - Determination of Break Even Point (Simple problems).

UNIT – III: INTRODUCTION TO MARKETS AND PRICING **(09 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: INTRODUCTION TO PRINCIPLES OF ACCOUNTING & CAPITAL **(09 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 - COMPUTERIZATION OF ACCOUNTING SYSTEM **(09 Periods)**

Introduction to Final Accounts - Trading account - Profit and Loss account and Balance Sheet with simple adjustments (Simple problems).
Computerization of Accounting System: Manual Accounting *Vs* Computerized Accounting – Advantages and Disadvantages of Computerized Accounting.

Total Periods: 45

TEXT BOOKS:

1. A.R. Aryasri, *Managerial Economics and Financial Analysis*,Tata Mc- Graw Hill, New Delhi, 3rd Edition, 2007.
2. R.Cauvery, U.K. Sudhanayak, M. Girija and R. Meenakshi, *Managerial Economics*, S. Chand and Company, New Delhi,2nd Edition, 2010.

REFERENCE BOOKS:

1. Varshaney and Maheswari, *Managerial Economics,* Sultan Chand and Sons, New Delhi, 19th Edition, 2005.
2. Ms. Samba Lalita, *Computer Accouting Lab Work*1stEdition, Kalyani Publishers, Ludhiana, 2009.
3. S.P. Jain and K.L. Narang, *Financial Accounting*, Kalyani Publishers, Ludhiana, 6th Edition, 2002.

II B.Tech. – I Semester
(16BT30101) CONSTRUCTION PLANNING AND PROJECT MANAGEMENT

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

PRE-REQUISITES: Course on Building Materials and Construction Technology.

COURSE DESCRIPTION: Construction planning and organization; Resource management - Manpower, Materials, Machinery; Project management; Elements and development of network; PERT and CPM.

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

CO1. Demonstrate the knowledge on construction planning and project management.
CO2. Identify critical activities and critical paths in a construction project and analyze networks.
CO3. Develop the network for analyzing critical path by using programme evaluation techniques.
CO4. Solve complex construction planning and management problems through proper interpretation of data.
CO5. Use appropriate tools and techniques for better construction planning and management.
CO6. Plan and manage construction ensuring safety.
CO7. Use environmentally sustainable approach in construction planning and management.
CO8. Maintain ethics in construction planning and management following rules and regulations.
CO9. Plan, monitor and control the finance in civil engineering construction.

DETAILED SYLLABUS

UNIT – I: CONSTRUCTION PLANNING AND ORGANIZATION (08 Periods)

Basic concepts in the development of construction plans, Choice of technology and construction method, Planning for construction projects, Steps involved in planning, Types of plans, Stages of planning by different agencies, Types of organization, Labour legislation in India, Workmen's Compensation Act of 1923 and Minimum Wages Act of 1948, Subsequent amendments, Safety in construction.

UNIT – II: RESOURCE MANAGEMENT (10 Periods)

Manpower: Resource smoothing, Resource leveling, Establishing labour productivity. **Materials:** Objectives of material management, Costs, Functions of material management departments, ABC classification of materials, Inventory of materials, Material procurement, Stores management.

Machinery: 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 – III: PROJECT MANAGEMENT (09 Periods)

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.

UNIT – IV: ELEMENTS AND DEVELOPMENT OF NETWORK (09 Periods)

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 of network, Work breakdown structure, Hierarchies, Illustrative examples.

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 TE and TL, Start and finish times of activity, Float, Critical activities and critical path, Resource allocation, Leveling, Crashing, Illustrative examples.

Total Periods: *45*

TEXT BOOKS:

1. K. K. Chitkara, *Construction Project Management: Planning, Scheduling and Controlling*, Tata McGraw-Hill Education Pvt. Ltd., 3rd Edition, 2014.
2. B. C. Punmia and K. K. Khandelwal, *Project Planning andControl with PERT and CPM,* Lakshmi Publications (P). Ltd., 4thEdition, 2010.

REFERENCE BOOKS:

1. Chris Hendrickson and Tung Au, *Project Management for Construction – Fundamentals Concepts for Owners,Engineers,Architects and Builders*, Prentice Hall, Pitsburgh, 2008.
2. Jha, *Construction Project Management,* Pearson Pubilications, 2011.
3. S. Seetharaman, *Construction Engineering and Management,* Umesh Publications, 3rd Edition, 2010.
4. R. Chudly, Roger Greno, Mike Hurst and Simon Topliss, *Construction Technology,* Vol. I and Vol. II*,* Longman, 5th Edition, 2011.

II B.Tech. – I Semester
(16BT30102) **FLUID MECHANICS AND HYDRAULIC MACHINERY**

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

PRE-REQUISITES: Courses on Engineering Mechanics, Multi–Variable Calculus and Differential Equations.

COURSE DESCRIPTION: Properties of fluids and pressure measurement; Hydrostatic forces; Fluid kinematics; Fluid dynamics; Closed conduit flow; Measurement of flow; Laminar and Turbulent flow; Hydraulic similitude and Model testing; Boundary layer theory; Open channel flow; Impact of jets; Hydraulic turbines; Centrifugal pumps.

COURSE OUTCOMES: On successful completion of this course, the students will able to:

CO1 Demonstrate the knowledge on basic properties of fluids, classification of flows and hydraulic machinery.
CO2 Analyze fluids, flows and forces in hydraulics.
CO3 Design piping systems, open channels and hydraulic machinery.
CO4 Address the problems and faults in the prototype preparation using the model analysis and provide suitable solutions.
CO5 Use of flow and pressure measurement devices in channels and hydraulic machinery.
CO6 Consider safety issues in the analysis and design of channels, pipes and hydraulic machinery.

DETAILED SYLLABUS:

UNIT - I: PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS (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 and mechanical gauges, Hydrostatic forces on submerged plane surfaces, Total pressure and centre of pressure on plane and curved surfaces, Buoyancy, Centre of buoyancy.

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

Description of fluid flow, Stream line, Path line and streak line, Stream tube, Classification of flows, Equation of continuity, Stream and Velocity potential functions, Flow net and its uses, Surface and body forces, Euler's and Bernoulli's equations, derivation, Practical applications, Momentum equation and its

application, Orifices and Mouthpieces, Notches and Weirs, Latest velocity measuring devices, Introduction to boundary layer, Separation and prevention.

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

Laws of fluid friction, Darcy–Weisbach equation, Minor losses, Pipes in series, Pipes in parallel, Total energy line and Hydraulic gradient line, Moody's chart, Dimensional analysis, Rayleigh's method and Buckingham's $\prod$ theorem, Model studies, Geometric, kinematic and dynamic similarities, Dimensionless numbers, Model laws, Scale effects, Flow around submerged bodies, Drag and lift.

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.

UNIT - V: TURBINES AND PUMPS (10 Periods)

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, Draft tube theory, Governing of turbines, Specific speed, Performance characteristics, Geometric similarity, Cavitation, causes, effects, Pump, Classification of centrifugal pumps, Work done, Minimum starting speed, Specific speed, Multistage pumps, Pumps in parallel and series, Performance of pumps, Characteristic curves, Net positive suction head(NPSH).

Total Periods: 45

TEXT BOOKS:

1. R. K. Rajput, *A Textbook of Fluid Mechanics*, S. Chand Publishers, 5th Edition, 2013.
2. R. K. Bansal, *Fluid Mechanics and Hydraulic Machines*, Laxmi Publishers, 9th Edition, 2011.

REFERENCE BOOKS:

1. P. N. Modi and S. M. Seth, *Hydraulics and Fluid Mechanics Including Hydraulic Machines*, Standard Book House, 20th Edition, 2011.
2. J. F. Douglas, J.M. Gaserek and J.A. Swaffirld, *Fluid Mechanics,* 5th Edition, Longman, 2010.
3. S. K. Som and G. Biswas, *Introduction to Fluid Machines*, Tata McGraw–Hill Publishers Pvt. Ltd, 2nd Edition, 2010.
4. Domkundwar and Domkundwar, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Dhanpat Rai and Co, 6th Edition, 2014.

II B.Tech. – I Semester

(16BT30103) **MECHANICS OF SOLIDS**

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

PRE-REQUISITES: Course on Engineering Mechanics

COURSE DESCRIPTION: Simple stresses and strains; Strain energy; Shear force and bending moment; Stresses in beams; Combined direct and bending stresses; Torsion; Springs; Thin cylinders; Thick cylinders.

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

CO1. Acquire the knowledge on simple stresses and strains, shear force, bending moment, stresses in beams, torsion, springs, thin cylinders and thick cylinders.
CO2. Analyze bars, beams, shafts, springs and cylinders for stresses, strains, strain energy, shear force and bending moment distributions.
CO3. Design beams, shafts, springs and cylinders for various loading conditions.
CO4. Solve complex engineering problems associated with beams, shafts, springs and cylinders through proper investigation and interpretation of stresses, strains, shear force and bending moment.
CO5. Use appropriate methods in analyzing bars, beams, shafts and cylinders.
CO6. Consider safety and stability issues in analyzing bars, beams, shafts, springs and cylinders.

DETAILED SYLLABUS:

UNIT – I: SIMPLE STRESSES AND STRAINS (09 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 – II: SHEAR FORCE AND BENDING MOMENT (09 Periods)

Types of beams, Supports and loads, 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 contra–flexure, Relation between SF and BM, Rate of loading at a section of beam.

UNIT – III: STRESSES IN BEAMS, DIRECT AND BENDING STRESSES (10 Periods)

Stresses in Beams: Theory of simple bending, Basic bending equation, 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 – IV: 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 – 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

TEXT BOOKS:

1. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *Mechanics of Materials*, Laxmi Publications Pvt. Ltd., 2001.
2. Bhavikatti, S. S., *Strength of Materials*, Vikas Publishing House, 3rd Edition, 2010.

REFERENCE BOOKS:

1. Rajput, R. K., *Strength of Materials (Mechanics of Solids),* S. Chand & Company LTD, 5th Edition, 2006.
2. Basu, A. R., *Strength of Materials,* Dhanpat Rai & Co. (P) LTD., 2nd Revised Edition, 2015.
3. 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.
4. Khurmi, R. S., Strength of Materials, S. Chand & Company Ltd., 23rd Edition, 2005.

II B.Tech. – I Semester
(16BT30104) **SURVEYING**

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

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics.

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

COURSE OUTCOMES: On successful completion of this course, the students will able to:

CO1. Demonstrate the knowledge on chain, compass, plane table, auto level, theodolite, teacheometer and EDM surveying; areas and volumes; curves.
CO2. Analyze surveying techniques, tools and survey data.
CO3. Design different types of curves and prepare contour maps.
CO4. Solve complex engineering survey problems through proper survey and interpretation.
CO5. Use appropriate modern tools in surveying.
CO6. Follow ethics in surveying practice.

DETAILED SYLLABUS:

UNIT - I: CHAIN AND COMPASS SURVEYING (09 Periods)

Chain Surveying: Classification of surveying, Objectives, Principles of surveying, Distance measurement, Accuracy and errors, Chain and its types, Optical square, Cross staff, Reconnaissance and site location-, Locating ground features by offsets, Field book, Chaining for outline of structures, Methods for overcoming obstacles, Conventional symbols, Plotting chain survey, Computation of areas, Errors in chain surveying and their elimination.

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

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

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

Leveling and Contouring: Types of leveling, Types of leveling instruments, Temporary and permanent adjustments, Height of instrument and rise and fall methods, Plotting longitudinal sections 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, Temporary and permanent adjustments of vernier transit, Measurement of horizontal and vertical angles, Heights and distances, Traversing, Closing error and distribution, Gale's traverse table, Omitted measurements.

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

UNIT - IV: COMPUTATION OF AREAS AND VOLUMES, CURVES (10 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 level sections with and without transverse slopes, Determination of the capacity of reservoir.

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

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

EDM Principle, Modern electronic surveying equipment - Digital levels, Digital theodolites, Total station; Total station - Working principle, Applications: Measurement of distance, Area, Height, Angles, Gradients, Traversing, Contouring, Stake out, Data analysis.

Total Periods: 45

TEXT BOOKS:

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

REFERENCE BOOKS:

1. S. K. Duggal, *Surveying – Vol. I and II*, Tata McGraw–Hill Publishing Co. Ltd., 4th Edition, 2013.
2. Arthur R. Benton and Philip J. Taetz, *Elements of Plane Surveying*, McGraw-Hill, 3rd Edition, 2010.
3. Arora, K. R., *Surveying – Vol. I and II,* Standard Book House, 14th Edition, 2011.
4. T. P. Kanetkar and S. V. Kulakarni, *Surveying and Leveling*, Pune Vidyarthi Griha Prakashan, Pune, 24th Edition, 2013.

II B.Tech. – I Semester
(16BT30131) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on 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: On successful completion of this course, the students will able to:

CO1. Demonstrate practical knowledge on flow measuring devices, losses in pipes and hydraulic machinery.
CO2. Analyze fluids, flows and forces in hydraulics.
CO3. Interpret the experimental results and suggest suitable solutions.
CO4. Use of flow and pressure measurement devices in channels and hydraulic machinery.
CO5. Consider safety issues in performing experiments.
CO6. Function effectively as an individual and as a team member in solving fluid mechanics and hydraulic machinery problems.
CO7. Communicate effectively on the experimental results in written, oral and graphical forms.

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 and variable head method
4. Calibration of rectangular notch
5. Determination of loss of head due to sudden contraction
6. Determination of coefficient of friction for pipes
7. Verification of Bernoulli's equation
8. Study of impact of jet on vanes
9. Study of hydraulic jump
10. Performance test on Pelton wheel
11. Performance test on Francis turbine
12. Performance test on Kaplan turbine
13. Performance test on single stage centrifugal pump
14. Performance test on multi stage centrifugal pump
15. Performance test on reciprocating pump

II B.Tech. – I Semester

(16BT30132) STRENGTH OF MATERIALS LAB

(Common to CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Mechanics of Solids/Strength of Materials.

COURSE DESCRIPTION: Tension test; Compression test; Bending test; Shear test; Torsion test; Hardness test; Maxwell reciprocal theorem.

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

CO1. Acquire the knowledge on conducting experiments for testing strength of materials such as steel, timber, metals, beams and springs.
CO2. Analyze test results on steel, timber, metals, beams and springs.
CO3. Recommend suitable materials for construction after interpreting test results.
CO4. Use appropriate method of testing construction materials.
CO5. Consider safety in construction material testing with societal perspective.
CO6. Follow ethics in reporting exact testing results.
CO7. Function effectively as an individual and as a team member in construction material testing.
CO8. Communicate effectively on construction material testing in written, oral and graphical forms.

LIST OF EXPERIMENTS:

1. Tension test on mild steel / HYSD bar
2. Compression test on wood
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

II B.Tech. – I Semester
(16BT30133) **SURVEYING LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics.

COURSE DESCRIPTION: Exercises on chain surveying; Compass surveying; Plane table surveying; Auto Levelling; Theodolite surveying; Total station surveying; Area by planimeter.

COURSE OUTCOMES: On successful completion of this course, the students will able to:

CO1. Demonstrate the knowledge on chain, compass, plane table, auto level, theodolite, and total station surveying setting out works, area measurement by planimeter.
CO2. Analyze surveying techniques, tools and survey data.
CO3. Design simple curves; and develop survey plots and contour maps.
CO4. Solve complex engineering survey problems through proper survey and interpretation.
CO5. Use appropriate modern tools in surveying.
CO6. Follow ethics in surveying practice.
CO7. Function effectively as an individual and as a team member in surveying.
CO8. Communicate effectively on surveying in written, oral and graphical forms.

LIST OF EXERCISES:

A. CHAIN SURVEY

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

B. COMPASS SURVEY

3. Determination of area by radiation method and 4plotting
4. Compass traversing and plotting

C. PLANE TABLE SURVEY

5. Resection – Two point and three point problems

D. LEVELLING

6. Longitudinal and cross–sectioning of a road profile and plotting
7. Contour plan of given area

E. THEODOLITE SURVEY

8. Measurement of horizontal angles by method of repetition and reiteration.
9. Trigonometric leveling – Measurement of heights and distances
10. Setting out a simple curves by Rankine's method of tangential angles
11. Setting out works for buildings and pipe lines.

F. TOTAL STATION SURVEY

12. Determination of area using total station
13. Determination of remote height using total station
14. Distance, gradient, and differential height between two inaccessible points using total station.
15. Stake-out using total station
16. Traversing using total station
17. Contouring using total station

G. AREA BY PLANIMETER

18. Determination of area of irregular figure by using planimeter

II B.Tech - II semester

(16BT3HS01) ENVIRONMENTAL STUDIES

(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	0	-	3

PRE-REQUISITES: Course on Engineering Chemistry

COURSE DESCRIPTION: Multidisciplinary nature of environment; Natural resources; Ecosystems; Biodiversity; Environment pollution and control; Social issues and environment; Human population and environment; Field studies.

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

CO1. Acquire knowledge on nature of environment, natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.

CO2. Analyze natural resources, ecosystems, biodiversity, environmental pollution and control, social issues and human population.

CO3. Develop strategies for environmental pollution control and natural resource management.

CO4. Solve environmental problems through proper analysis and interpretation of environmental data.

CO5. Choose appropriate techniques in environmental pollution control and natural resource management.

CO6. Understand the impact of social issues and population on environment.

CO7. Provide solutions to individuals, industries and government for environmental sustainable development.

CO8. Follow environmental protection laws for sustainable development.

CO9. Communicate effectively on environmental issues in the form reports.

DETAILED SYLLABUS:

UNIT - I: MULTIDISCIPLINARY NATURE OF ENVIRONMENT AND NATURAL RESOURCES (11 Periods)

Multidisciplinary Nature of Environment: Multidisciplinary nature of environment, Segments of environment - Lithosphere, Hydrosphere, Atmosphere, Biosphere; Need for public awareness.

Natural Resources: Renewable and non-renewable resources and associated problems - (a) Forest resources: Use and over exploitation,

Deforestation-causes, effects and remedies, Case studies, (b) Water resources: Use and over utilization of surface and groundwater, Conflicts over water, Benefits and problems of large dams, Case studies, (c) Mineral resources: Mining, Adverse effects, Case studies, (d) Food resources: World food problems, Changes caused by agriculture and overgrazing, Effects of modern agriculture, Water logging and salinity, Case studies, (e) Energy resources: Growing needs, Renewable energy resources – Solar, Wind, Hydropower, Hydrogen fuel; Non-renewable energy resources - Coal, Natural gas, Nuclear energy, Role of an individual in conservation of natural resource and equitable use of resources for sustainable lifestyles.

UNIT - II: ECOSYSTEMS AND BIODIVERSITY (10 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, Energy flow in the ecosystem, Ecological succession.

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: ENVIRONMETAL POLLUTION AND CONTROL (8 Periods)

Causes, Adverse effects and control measures of pollution - Air pollution, Water pollution, Soil pollution, Noise pollution, Thermal pollution, Nuclear pollution; Solid waste management – Causes, Effects and control measures of urban and industrial wastes; Hazards and disaster management – Floods, Earthquakes, Tsunamis, Case studies.

UNIT - IV: SOCIAL ISSUES AND THE ENVIRONMENT (8 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 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 (8 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: Environmental assets – Pond/Forest/Grassland/ Hill/Mountain/ Environment impact assessment procedures for local environmental issues.

Total Periods: 45

TEXT BOOKS:

1. A. Kaushik and C. P. Kaushik, *Environmental Studies*, New Age International (P) Ltd Publications, 4th Edition, 2014.
2. Erach Barucha, *Environmental Studies*, Orient Blackswan, 2nd Edition, 2013.

REFERENCE BOOKS:

1. R. Rajagopalan, *Environmental Studies*, Oxford University Press, 2nd Edition, 2011.
2. Benny Joseph, *Environmental Studies*, Tata McGraw-Hill, 2nd Edition, 2009.
3. B. S. Chauhan, *Environmental Studies*, University Science Press, 2008.
4. M. Anji Reddy, *Text Book of Environmental Sciences and Technology*, BS Publications, 2007.

II B. Tech. – II Semester
(16BT40101) CONCRETE TECHNOLOGY

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

PRE-REQUISITES: Course on Building Materials and Construction Technology.

COURSE DESCRIPTION: Cement and admixtures; Aggregates; Fresh and hardened concrete; Tests on concrete; Elasticity, Creep and Shrinkage; NDT; Mix design- ACI and IS methods; Special concretes.

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

CO1. Demonstrate the knowledge on properties of cement, admixtures, aggregates, fresh and hardened concrete; elasticity, creep and shrinkage of concrete; special concrete.
CO2. Characterize the constituent materials of concrete in choice of mix proportion.
CO3. Design the concrete mix using IS-10262 and ACI method.
CO4. Conduct various tests on fresh and hardened concrete.
CO5. Make use of modern tools in Non-Destructive testing of concrete.
CO6. Encourage the use of sustainable and environmental friendly constituent materials in manufacture of concrete.
CO7. Maintain ethical standards for quality in concrete.

DETAILED SYLLABUS:

UNIT - I: CEMENT, ADMIXTURES AND AGGREGATES (09 Periods)

Cements and Admixtures: Portland cement, Grades of cement, Admixtures - mineral admixtures, chemical admixtures, Effects of admixtures on concrete properties.

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

UNIT - II: FRESH AND HARDENED CONCRETE (10 Periods)

Workability, Factors affecting, Measurement of workability, Setting times of concrete, Effect of time and temperature on workability, Segregation and bleeding, Mixing and vibration, Manufacture of concrete, Ready mix concrete, Quality of mixing water, 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.

UNIT - III: ELASTICITY, CREEP, SHRINKAGE AND NDT **(08 Periods)**

Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep, Relation between creep and time, Nature of creep, Effects of creep, Shrinkage, Types of shrinkage, Non-destructive testing methods – Rebound hammer, Ultrasonic pulse velocity method, Pullout; Codal provisions for NDT.

UNIT - IV: MIX DESIGN **(10 Periods)**

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.

UNIT - V: SPECIAL CONCRETES **(08 Periods)**

Light weight aggregates; Applications, types and properties - Light weight aggregate concrete, Cellular concrete, No-fines concrete, High density concrete, Fibre reinforced concrete, Polymer concrete, High performance concrete, Self consolidating concrete, SIFCON, Bacterial concrete (Self-healing concrete).

Total Periods: *45*

TEXT BOOKS:

1. M. S. Shetty, *Concrete Technology*, S. Chand and Company Ltd., New Delhi, 2003.
2. A. M. Neville, *Properties of Concrete*, Pearson Publication, 5th Edition, 2012.

REFERENCE BOOKS:

1. A. R. Santhakumar, *Concrete Technology*, Oxford University Press, New Delhi, 2006.
2. M. L. Gambir, *Concrete Technology*, Tata McGraw-Hill Publishing Co. Ltd, New Delhi, 3rd Edition, 2007.
3. Gupta, B. L. and Amit Gupta, *Concrete Technology*, Jain Book Agency, 4th Edition, 2014.
4. ACI 211.1-91: Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete (Reapproved 2009).

CODE:

Pages 1 to 4 from IS: 10262–2009: Concrete Mix Proportioning – Guidelines, **are to be permitted into the examination hall.**

II B.Tech. – II Semester
(16BT40102) ENGINEERING GEOLOGY

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

PRE-REQUISITES: -

COURSE DESCRIPTION: General geology and weathering; Mineralogy and petrology; Structural geology and geophysical studies; Groundwater; Earthquake and landslides; Dams; Reservoirs; Tunnels; Bridges.

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

CO1. Demonstrate basic knowledge on weathering, minerals, rocks, geological structures, geophysical methods, groundwater, earthquakes and landslides and site selection for civil engineering structures.
CO2. Analyze minerals, rocks, geological structures and failure of structures due to geological considerations.
CO3. Conduct geological investigations and give recommendations for the site suitability for construction.
CO4. Use modern methods and apply suitable techniques in geological study for civil engineering applications.
CO5. Demonstrate causes and effects of natural hazards and suggest remedial measures for the societal safety.
CO6. Consider environmental sustainability in exploitation of groundwater and construction materials using suitable methods.
CO7. Communicate effectively on geological maps and reports to the engineering community.

DETAILED SYLLABUS:

UNIT – I: GENERAL GEOLOGY AND WEATHERING (8 Periods)

General Geology: Relevance of geology in civil engineering, Failures of civil engineering constructions due to geological draw backs, Case histories, Geological report for different phases of site investigations.

Weathering: Types of weathering, Effects of weathering of rocks, Engineering classification of weathered rock masses, Importance of weathering with reference to dams, reservoirs, tunnels and bridges.

UNIT – II: MINERALOGY AND PETROLOGY (10 Periods)

Mineralogy: Methods of study of minerals, Advantages of study of minerals by physical properties, Physical properties of minerals - Feldspar, Quartz, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite.

-Petrology: Origin, Geological classification, Structures, Textures of rocks; Megascopic study of rocks - Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble, Slate; Engineering properties of rocks.

UNIT – III: STRUCTURAL GEOLOGY AND GEOPHYSICAL STUDIES (10 Periods)

Structural Geology: Outcrop, Strike and dip, Classification and effects - Folds, Faults, Unconformities, Joints; Problems - Thickness, Strike and dip of beds; Structural geology maps.

Geophysical Studies: Gravity methods, Magnetic methods, Electrical resistivity methods, Seismic refraction methods, Radiometric methods and geothermal methods, Civil engineering applications.

UNIT – IV: GROUNDWATER, EARTHQUAKES AND LANDSLIDES (9 Periods)

Groundwater: Hydrological cycle, Types of groundwater, Hydrological properties of rocks, Cone of depression, Geological controls of groundwater movement.

Earthquakes: Intensity and magnitude scales, Shield areas and seismic zones, Causes and effects, Precautions to be taken for building construction in seismic areas.

Landslides: Classification, Causes and effects, Measures to be taken to prevent their occurrence.

UNIT – V: DAMS, RESERVOIRS, TUNNELS AND BRIDGES (8 Periods)

Geological considerations in a dam and reservoir sites, Analysis of dam failures of the past, Factors contributing to the success of a reservoir, Geological considerations in tunneling and in a bridge site, Effects of tunneling on the ground.

Total Periods: 45

TEXT BOOKS:

1. N. Chenna kesavulu, *Engineering Geology*, Mc–Millan India Ltd., 2nd Edition, 2014.
2. Parbin Singh, *A Text Book of Engineering and General Geology*, S. K. Kataria and Sons, 8th Edition, 2012.

REFERENCE BOOKS:

1. D. Venkata Reddy, *Engineering Geology*, Vikas Publications, 2014.
2. Subinoy Gangopadhyay, *Engineering Geology*, Oxford university press, 3rd Edition, 2015.
3. Vasudev Kanithi, *Engineering Geology*, University Press, 2012.
4. S. K. Dhuggal, H. K. Pandey, N. Rawal, *Engineering Geology*, McGraw-Hill Education Pvt. Ltd., 2nd Edition, 2014.

II B.Tech.– II Semester
(16BT40103) ENGINEERING HYDROLOGY

Internal Marks	External Marks	Total Marks	L	T	P	C
30	70	100	3	1	–	3

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery

COURSE DESCRIPTION: Hydrologic cycle; Applications and history; Weather and seasons in India; Precipitation; Evaporation; Evapotranspiration; Runoff; Groundwater hydrology; Hydrograph analysis; Design flood; Erosion; Reservoir sedimentation.

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

CO1. Acquire the basic knowledge on surface and groundwater hydrology.
CO2. Analyze problems associated with surface and groundwater hydrology.
CO3. Design of floods using Muskingum's method.
CO4. Provide solutions for complex engineering problems in hydrology through proper interpretation data.
CO5. Use appropriate techniques for solving issues related to hydrology
CO6. Address the safety issues in flood routing, erosion and reservoir sedimentation.
CO7. Understand the effect of erosion and reservoir sedimentation on the environment and provide solutions to ensure environmental sustainability.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO HYDROLOGY AND PRECIPITATION (09 Periods)

Scope of hydrology, Hydrologic cycle, Practical applications and historical development, Precipitation - Types and forms, Weather and seasons in India, Measurement of rainfall, Recording and non recording type of rain gauges, Errors in measurement, Analysis and interpretation of rainfall data, Methods of calculation of mean precipitation over an area.

UNIT - II: EVAPORATION AND INFILTRATION (09 Periods)

Process of evaporation, Factors affecting evaporation, Estimation, Methods of reduction, Factors affecting infiltration, Infiltration equation

and indices, Interception, Evapotranspiration - Factors affecting, Measurement.

UNIT - III: RUNOFF AND GROUNDWATER HYDROLOGY

(09 Periods)

Components, Factors affecting runoff, Rainfall–runoff relationships, Flow mass curve, Flow duration curve, Mass curve of rainfall, Hyetograph, Double mass curve, Stream flow measurement – Stage, Discharge - Area velocity method, Moving boat method, Current meter, Float method; Groundwater hydrology - Steady state well hydraulics and aquifers, Application of Darcy's law.

UNIT - IV: HYDROGRAPH ANALYSIS AND DESIGN FLOOD

(09 Periods)

Components of hydrograph, Unit hydrograph, Derivation, Use and limitation of unit hydrograph, Flood – Methods, Envelope curves, Empirical formulae, Rational method, Unit hydrograph method, S-Curve unit hydrograph, Frequency analysis, Flood routing – Muskingum's method.

UNIT - V: EROSION AND RESERVOIR SEDIMENTATION (09 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

TEXT BOOKS:

1. K. Subramanya, *Engineering Hydrology*, Tata McGraw–Hill Education Pvt. Ltd., 4th Edition, 2013.
2. P. Jaya Rami Reddy, *A Text Book of Hydrology,* University Science Press, An Imprint of Laxmi Publications Pvt. Ltd., 3rd Edition, 2011.

REFERENCE BOOKS:

1. H. M. Raghunath, *Ground Water,* Wiley Eastern Ltd., 3rd Edition, 2009.
2. David Keith Todd, *Groundwater Hydrology,* Wiley India Pvt. Ltd., 2nd Edition, 2010.
3. V. T. Chow., *Hand Book of Applied Hydrology,* McGraw–Hill Education Pvt. Ltd., 2nd Edition, 2000.
4. C. S. P. Ojah, R. Berndtsson, P. Bhunya, *Engineering Hydrology,* Oxford Higher Education, 5th Edition, 2008.

II B.Tech. – II Semester
(16BT40104) STRUCTURAL ANALYSIS – I

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

PRE-REQUISITES: Course on Engineering Mechanics, Mechanics of Solids.

COURSE DESCRIPTION: Principal stresses and strains; Deflection of beams, Macaulay's method and double integration method; Columns and struts; Indeterminate Beams; Theories of failure; Unsymmetrical bending and shear centre.

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

CO1. Elucidate the knowledge on principal stresses and strains, slopes and deflections of beams using double integration, Macaulay's and moment area method; columns and struts, fixed and propped cantilever beams, continuous beams, theories of failure and unsymmetrical bending and shear centre.
CO2. Analyze different beams, columns and struts, unequal sections and theories of failure.
CO3. Solve complex problems linked with different beams, columns and channel sections.
CO4. Use appropriate methods to analyze the beams and columns.
CO5. Ensure safety in the analysis of beams and columns.
CO6. Present the results of analysis such as stresses, bending moment, shear force, slope and deflections effectively in written and graphical forms.

DETAILED SYLLABUS:

UNIT – I: PRINCIPAL STRESSES AND STRAINS (09 Periods)

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

UNIT – II: DEFLECTION OF BEAMS (10 Periods)

Bending into a circular arc, Slope, deflection and radius of curvature, Differential equation for the elastic curve of a beam, Double integration and Macaulay's methods, Mohr's theorems, Moment area method, Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L. and uniformly varying loads.

UNIT – III: COLUMNS AND STRUTS (09 Periods)

Short, medium and long columns, 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, Secant formula.

UNIT – IV: INDETERMINATE BEAMS (09 Periods)

Fixed and Propped Cantilever 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; Deflection of fixed beams, Effect of sinking and rotation of support, Shear force and bending moment diagrams of propped cantilever.

Continuous Beams: Continuous beams **–** Clapeyron's theorem of three moments, Analysis of continuous beams with one or both ends fixed, Continuous beams with overhang.

UNIT – V: THEORIES OF FAILURE, UNSYMMETRICAL BENDING AND SHEAR CENTRE (08 Periods)

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

Unsymmetrical Bending and Shear Centre: Centroidal principal axes of section, Stress in beams due to unsymmetrical bending, Principal axes, Location of neutral axis, Shear centre of channel section and unequal section.

Total Periods: 45

TEXT BOOKS:

1. V. N. Vazirani, M. M. Ratwani and S. K. Duggal, *Analysis of Structures– Vol. I and Vol. II*, Khanna Publications, 17th Edition, 2013.
2. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, Dhanpat Rai Publishing Co. Ltd., 9th Edition, 2014.

REFERENCE BOOKS:

1. Khurmi, R. S., *Theory of Structures*, S. Chand & Company Ltd., 22nd Edition, 2013.
2. Bhavikatti, S. S., *Structural Analysis– Vol. I*, I. K. International Publishing House Pvt. Limited, 3rd Edition, 2008.
3. Pandit, G., Gupta, S. and Gupta, R., *Theory of Structures – Vol. I*, Tata Mc–Graw Hill Publishing Co. Ltd., 2nd Edition, 1999.
4. Basu, A. R., *Strength of Materials,* Dhanpat Rai & Co. (P) Ltd., 2nd Revised Edition, 2015.

II B.Tech. II Semester

(16BT40105) **WATER SUPPLY ENGINEERING**

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

PREREQUISITES: Courses on Environmental Studies, Fluid Mechanics and Hydraulic Machinery.

COURSE DESCRIPTION: Water sources; Quality; Quantity; Demand; Collection; Conveyance and distribution; Water treatment; Distribution; Water supply arrangements in buildings.

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

CO1. Acquire the basic knowledge on sources, quality, quantity, demand, conveyance, treatment systems, storage and distribution of water; and water supply arrangements in buildings.
CO2. Analyse problems associated with water supply engineering.
CO3. Design water conveyance, treatment, storage and distribution systems.
CO4. Solve water supply engineering problems through proper investigations and interpretation.
CO5. Use appropriate techniques in solving water supply engineering problems.
CO6. Provide solutions to water supply engineering problems ensuring health and safety.
CO7. Maintain quality standards in analysis, treatment and distribution of water in water supply schemes.

DETAILED SYLLABUS:

UNIT – I: WATER SOURCES AND QUALITY (08 Periods)

Importance of water supply engineering, Need for protected water supply, Objectives of water supply systems, Flow diagram of water supply systems, Different sources of water, Quantity and quality of different sources – Physical, chemical and biological impurities and their testing parameters.

UNIT – II: QUANTITY, DEMAND, COLLECTION AND CONVEYANCE (10 Periods)

Types and variation in water demand, Factors affecting water demand, Design period, Forecasting of population, different methods and their suitability, Water quality standards – Drinking, Construction; Intake works for collection of surface water, Conveyance of water – Gravity

and pumping methods; Different materials used for conveying conduits and their suitability.

UNIT – III: WATER TREATMENT (09 Periods)

Conventional water treatment processes – Units and their functions; Aeration, Coagulation, Flocculation, Clarification, Determination of optimum dose of alum for coagulation of water, Theory of filtration, Different types of filters and their design, Disinfection – Disinfectants, Mechanism of disinfection, Different methods of disinfection, Break point chlorination, Types of chlorination, Dose of disinfectant.

UNIT – IV: ADVANCED TREATMENT METHODS AND DISTRIBUTION (09 Periods)

Advanced Treatment Methods: Removal of fluorides, arsenic, hardness, iron and manganese, salinity, colour, organic chemical and biological residues; Adsorption with activated carbon, ion–exchange resins; Membrane processes, Chemical oxidation.

Distribution: Distribution**-** Systems of distribution, Distribution reservoirs, Distribution networks, Design of simple networks, Pipe accessories, Valves and their location and suitability, EPANET software.

UNIT – V: WATER SUPPLY ARRANGEMENTS IN BUILDINGS (09 Periods)

Definition of technical terms used in water supply arrangements, House water connection, Water storage, Water piping systems in buildings, Connection from water main to building, Water supply fittings, Principles and precautions in laying pipe lines in the premises of buildings, Detection and prevention of leakages.

Total Periods: 45

TEXT BOOKS:

1. S. K. Garg*, Environmental Engineering, Vol. I: Water Supply Engineering,* Khanna Publishers, 20th Edition, 2011.
2. G. S. Birdie and J. S. Birdie, *Water Supply and Sanitary Engineering*, Dhanpat Rai and Sons Publishers, 9th Edition, 2011.

REFERENCE BOOKS:

1. K. N. Duggal, *Elements of Environmental Engineering*, S. Chand Publishers, 2010.
2. H. S. Peavy and D. R. Rowe, *Environmental Engineering*, McGraw–Hill Publishing Company, 2nd Edition, 1984.
3. P. N. Modi, *Water Supply Engineering*, Standard Book House, 3rd Edition, 2010.
4. S. K. Duggal, *Elements of Water Supply Engineering,* S. Chand & Co, 2010.

II B.Tech. – II Semester

(16BT40131) **CONCRETE TECHNOLOGY LAB**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Course on Concrete Technology.
COURSE DESCRIPTION: Testing of cement and sand; Testing of fresh and hardened concrete mixes; Non-destructive tests on concrete.

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

CO1. Demonstrate knowledge on test for cement, sand and concrete.
CO2. Characterize the constituent material of concrete in the choice of mix proportion.
CO3. Design the concrete mix using IS-10262.
CO4. Conduct various tests on cement, sand and concrete in fresh and hardened state.
CO5. Make use of modern tools in non-destructive testing of concrete.
CO6. Maintain ethical standards for quality in concrete.
CO7. Function effectively as an individual and as a team member in concrete technology using modern tools and techniques.
CO8. Communicate effectively on concrete technology in written, oral and graphical forms.

LIST OF EXPERIMENTS:

1. Normal consistency test of cement
2. Test for initial and final setting time of cement
3. Soundness test of cement
4. Specific gravity test of cement
5. Compressive strength test of cement
6. Test for fineness of cement by dry sieving
7. Test for fineness of cement by Blaine's permeability apparatus
8. Bulking of sand test
9. Concrete mix design – IS 10262
10. Slump cone test
11. Compaction factor test
12. Vee-Bee consistometer test
13. Compressive strength test of concrete
14. Test for modulus of elasticity of concrete
15. Flexural strength test of concrete
16. Split tensile strength test of concrete
17. Rebound hammer test
18. PUNDIT
19. Concrete core test
20. Rapid chloride permeability test for durability of concrete

II B.Tech. – II Semester
(16BT40132) ENGINEERING GEOLOGY LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

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; CIPW norm calculations; Resistivity survey.

COURSE OUTCOMES: On successful completion of this course the students will be able to:

CO1. Apply the knowledge on identification of minerals and rocks, structural geology problems and maps and geophysical studies.
CO2. Analyze different minerals, rocks, geophysical data for engineering applications.
CO3. Interpret the geological maps and geophysical data with emphasis on practical applications in civil engineering.
CO4. Use modern tools for geologic investigations on the availability of minerals, rocks and groundwater.
CO5. Consider safety in geological investigations.
CO6. Follow standards in geological investigations.
CO7. Function effectively as an individual, and as a member or leader in teams to solve engineering geology problems.
CO8. Communicate effectively on geological information in written, oral and graphical forms.

LIST OF 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) GEOLOGICAL MAPS

6. Study of geological maps, drawing and interpretation of geological sections in horizontal beds
7. Study of geological maps, drawing and interpretation of geological sections in vertical beds
8. Study of geological maps, drawing and interpretation of geological sections in beds with fault plane

D) STRUCTURAL GEOLOGY PROBLEMS

9. Thickness
10. Strike and dip
11. Bore hole

E) NORM FORM CALCULATIONS

12. Normative minerals analysis

F) GEOPHYSICAL STUDIES

13. Electrical resistivity survey (not for the examination)

Seismic surveys (not for the examination)

II B.Tech. – II Semester

(16BT4HS31) **SOFT SKILLS LAB**

(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: English Language Laboratory in I B.Tech or English Laboratory at Diploma Level.

COURSE DESCRIPTION: Body Language; Assertiveness; Goal Setting; Creative Thinking; Interpersonal Skills; Team Work; Conflict Management; Etiquette; Report Writing; Group Discussions; Interviewing Skills.

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

CO1. Acquire knowledge in
- a) Goal Setting
- b) Creative Thinking
- c) Leadership Skills and
- d) Team Work

CO2. Analyse the situations and develop skills for
- a) Body Language
- b) Personality Development and
- c) Stress Management

CO3. Apply the techniques of soft skills in a problem situation enhanced through multimedia software.

CO4. Function effectively as an individual and as a member in diverse teams.

CO5. Communicate effectively in public speaking in formal and informal forums.

LIST OF EXERCISES:

1. Body Language
2. Assertiveness
3. Goal Setting
4. Creative Thinking
5. Interpersonal Skills
6. Team Work
7. Conflict Management
8. Etiquette
9. Report Writing
10. Resume Writing
11. Group Discussions
12. Interviewing Skills

TEXT BOOK:

1. Department Lab Manual.

REFERENCE BOOKS:

1. R. C. Sharma & Krishna Mohan, *Business Correspondence and Report Writing*, Tata McGraw-Hill Publishing Company Limited, Third Edition, New Delhi, 2012.
2. Gopalswamy Ramesh and Mahadevan Ramesh, *The Ace of Soft Skills*, Pearson, Noida, 2010.
3. Jeff Butterfeild, *Soft Skills for Everyone*, Cengage learning, Delhi, 2011.
4. Barun K. Mitra, *Personality Development and SoftSkills*,Oxford University Press, Noida, 2012.

SUGGESTED SOFTWARES:

1. ETNL Language Lab Software Version 4.0
2. GEMS – Globarena E- Mentoring System
3. Speech Solutions.
4. English Pronunciation Dictionary by Daniel Jones.
5. Learning to Speak English 8.1, The Learning Company – 4 CDs.
6. Mastering English: Grammar, Punctuation and Composition.
7. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
8. Dorling Kindersley Series of Grammar, Punctuation, Composition etc.
9. Language in Use 1, 2 & 3.
10. Cambridge Advanced Learner's Dictionary - 3rd Edition.
11. Centronix – Phonetics.
12. Let's Talk English, Regional Institute of English South India.
13. Ultimate English Tutor.

III B.Tech. – I Semester
(16BT50101) IRRIGATION ENGINEERING

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

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery, Engineering Hydrology.

COURSE DESCRIPTION: Irrigation and soil moisture; Diversion head works; Gravity and earth dams; Canal structures; Cross drainage works.

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

CO1. Identify the importance of various irrigation practices and irrigation structures.
CO2. Analyze irrigation structures.
CO3. Design irrigation structures.
CO4. Provide solutions to the various types of failures of hydraulics structures.
CO5. Use appropriate techniques in solving irrigation engineering problems.
CO6. Ensure safety and stability of irrigation structures.
CO7. Follow IS codes in the design of irrigation structures.
CO8. Consider environmental sustainability in the analysis and design of irrigation structures.

DETAILED SYLLABUS:

UNIT - I: IRRIGATION AND SOIL MOISTURE (09 Periods)

Necessity and importance, Advantages and disadvantages, Types of irrigation, Application of irrigation water, Standards for irrigation water, Soil–water–plant relationship, Vertical distribution of soil moisture, Soil moisture constants, Consumptive use, Duty–delta relationship, Factors affecting duty, Irrigation efficiency.

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 AND EARTH DAMS (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, Spillways–Types, Design of Ogee spillway.

Earth Dams: Types, Causes of failure, Criteria for safe design, Seepage through earth dam, Measures of seepage control, Stability analysis.

UNIT - IV: CANAL STRUCTURES (09 Periods)

Types 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.

TEXT BOOKS:

1. S. K. Garg, *Irrigation Engineering and Hydraulic Structures,* Khanna Publishers, 24th Edition, 2012.
2. P. N. Modi, *Irrigation Water Resources and Water Power Engineering,* Standard Book House, 7th Edition, 2008.

REFERENCE BOOKS:

1. K. R. Arora, *Irrigation, Water Power a*nd *Water Resources Engineering*, Standard Publishers Distributers, 4th Edition, 2013.
2. G. L. Asawa*, Irrigation a*nd *Water Resources Engineering,* New Age International Limited, 2012.
3. R. K. Sharma and T. K. Sharma, *Irrigation Engineering,* S. Chand Publishers, 3rd Edition, 2007.
4. B. C. Punmia and P. B. B. Lal*, Irrigation a*nd *Water Power Engineering,* Laxmi Publications, 16th Edition, 2011.

III B.Tech. – I Semester
(16BT50102) REINFORCED CEMENT CONCRETE STRUCTURES

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

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Engineering Mechanics, Mechanics of Solids, Structural Analysis – I, Structural Analysis – II.

COURSE DESCRIPTION: Beams (Working stress and limit state methods); Shear, torsion and bond; Slabs; Columns; Shallow footings and Stair case.

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

CO1. Demonstrate the knowledge concepts, techniques and applications of design of reinforced cement concrete structural elements: beams, slabs, columns, footings, stair cases.
CO2. Analyze different reinforced cement concrete structural elements.
CO3. Design different reinforced cement concrete structural elements.
CO4. Recommend suitable structural elements for reinforced cement concrete structures.
CO5. Use appropriate method to design RCC structural elements.
CO6. Ensure the RCC design as per safety and serviceability requirements.
CO7. Uphold Ethics in RCC design.

DETAILED SYLLABUS:

UNIT - I: BEAMS (09 Periods)

Beams (Working Stress Method): Behaviour of RCC beam in bending, Concept of working stress method, Design of beams - Rectangular, T, L.

Beams (Limit State Method): Concept of limit state method, Design of beams for flexure, shear, torsion - 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

TEXT BOOKS:

1. S. Unnikrishna Pillai and Devdas Menon, *Reinforced Concrete Design*, Tata Mc. Graw Hill, 3rd Edition, 2010.
2. S. K. Roy and N. C. Sinha, *Fundamentals of Reinforced Concrete*, S. Chand & Company Ltd., 5th Edition, 2010.

REFERENCE BOOKS:

1. P. C. Varghese, *Limit State Designed of Reinforced Concrete*, Prentice Hall of India, 2nd Edition, 2010.
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Reinforced Concrete structures – Vol. I*, Laxmi Publications Pvt. Ltd., 19th Edition, 2010.
3. N. Krishna Raju and R. N. Pranesh, *Reinforced Concrete Design*, CBS Publishers Distributors, 3rd Edition, 2010.
4. M. L. Gambhir, *Fundamentals of Reinforced Concrete Design,* Prentice Hall of India Pvt. Ltd., 2010.

CODE:
IS: 456–2000: Plain and Reinforced Concrete, **is to be permitted into the examination hall.**

III B.Tech. – I Semester
(16BT50103) SOIL MECHANICS

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

PRE-REQUISITES: Courses on Engineering Mechanics, Engineering Geology.

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

CO1. Gain knowledge on classification and engineering behavior of soils.
CO2. Analyze properties and engineering behavior of soils.
CO3. Address complex problems associated with soils and suggest suitable solutions.
CO4. Use appropriate techniques to determine the soil properties.
CO5. Consider safety through proper assessment of engineering behavior of soils.
CO6. Demonstrate the need of soil testing for sustainable development.
CO7. Practice soil engineering in accordance with IS Codes.
CO8. Communicate effectively on soil engineering problems in written and graphical forms.

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, 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

TEXT BOOKS:

1. Gopal Ranjan and A. S. R. Rao, *Basic and Applied Soil Mechanics,* New Age International Pvt. Ltd., 2nd Revised Edition, 2014.
2. K. R. Arora, *Soil Mechanics and Foundation Engineering,* Standard Publishers and Distributors, 7th Edition, 2014.

REFERENCE BOOKS:

1. Braja M. Das, *Principles of Geotechnical Engineering,* Cengage Learning India, 7th Edition, 2009.
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundation,* Laxmi Publications Pvt. Ltd., 16th Edition, 2014.
3. C. Venkatramaiah, *Geotechnical Engineering,* New Age International Publishers, 3rd Edition, 2010.
4. Lambe, T. W. and Whitman, R. V., *Soil Mechanics,* John Wiley and Sons, Singapore, 2000.

III B.Tech. – I Semester
(16BT50104) STRUCTURAL ANALYSIS – II

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

PRE-REQUISITES: Course on Structural Analysis – I.

COURSE DESCRIPTION: Shear force and bending moment for moving loads; Influence lines; Slope–deflection method; Moment distribution method; Kani's method; Energy method; Redundant pin–jointed frames; Plastic analysis.

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

CO1. Demonstrate the knowledge on moving loads, influence lines, slope deflection method, moment distribution method, Kani's method, energy method and plastic analysis.
CO2. Analyze beams and frames using slope-deflection method, moment distribution method and Kani's method; beams subjected to moving loads, trusses.
CO3. Address complex problems associated with the analysis of beams for collapse loads using plastic theory.
CO4. Use appropriate method to analyze civil engineering structures.
CO5. Follow the analyzing principles to ensure safety of the structures.
CO6. Present the results of analysis such as bending moment and shear force distributions and deflections effectively in written and graphical forms.

DETAILED SYLLABUS:

UNIT - I: MOVING LOADS AND INFLUENCE LINES **(10 Periods)**

Moving Loads: Maximum shear force and bending moment at a given section and absolute maximum SF and BM due to single concentrated load, UDL longer than the span, UDL shorter than the span, two point loads and several point loads; Equivalent uniformly distributed load, Focal length.

Influence Lines: 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; Influence lines for forces in members of Pratt and Warren trusses.

UNIT - II: INDETERMINATE BEAMS (10 Periods)

Slope–Deflection Method: Basic concepts, Slope deflection equation, Application to continuous beams with and without settlement of supports.

Moment Distribution Method: Basic concepts, Stiffness factor, Carryover factor, Application to continuous beams with and without settlement of supports.

UNIT - III: KANI'S METHOD AND ENERGY METHOD (09 Periods)

Kani's Method: Analysis of continuous beams including settlement of supports, Single bay- single storey portal frames with and without side sway.

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.

UNIT - IV: REDUNDANT PIN–JOINTED FRAMES (08 Periods)

Indeterminate frames, Static and kinematic indeterminacies, Castigliano's theorem, Analysis of pin–jointed frames up to two degrees of internal and external indeterminacies.

UNIT - V: PLASTIC ANALYSIS (08 Periods)

Introduction to plastic analysis, Shape factor, Plastic hinge; Collapse loads for simply supported beams, Upper bound and lower bound theorems, propped cantilevers and two span continuous beams.

Total Periods: *45*

TEXT BOOKS:

1. R. Vaidyanathan and P. Perumal, *Structural Analysis* - Vol. I and II, Laxmi Publications, 4th Edition, 2016.
2. V. N. Vazirani, M. M. Ratwani and S. K. Duggal, *Analysis of Structures* – Vol. II, Khanna Publications, 16th Edition, 2013.

REFERENCE BOOKS:

1. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, Dhanpat Rai Publishing Co. Ltd., 9th Edition, 2014.
2. S. S. Bhavikatti, *Structural Analysis* – Vol. I and II, Vikas Publishing House Pvt Ltd., 4th Edition, 2010
3. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, SMTS–II – *Theory of Structures*, Laxmi Publications (P) Ltd., 13th Edition, 2017.
   R. S. Khurmi, *Theory of Structures*, S. Chand & Company Ltd., 22nd Edition, 2010.

III B.Tech. – I Semester
(16BT50105) **WASTEWATER TECHNOLOGY**

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

PREREQUISITES: Course on Water Supply Engineering.

COURSE DESCRIPTION: Wastewater collection systems and sewer design; Sewage characteristics; Preliminary and primary treatment of sewage; Secondary treatment of sewage; Tertiary treatment; Sludge management; Effluent disposal.

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

CO1. Demonstrate knowledge on sewage collection systems, characteristics, treatment, sludge management and effluent disposal.
CO2. Analyze characteristics, treatment methods and disposal techniques of wastewater.
CO3. Design sewer pipeline and storm water drain, wastewater treatment plant units.
CO4. Investigate and recommend suitable solutions to complex wastewater treatment and disposal problems.
CO5. Use appropriate techniques to treat and dispose wastewater.
CO6. Understand the effectsof improper wastewater treatment and disposal on health and safety.
CO7. Encourage environmental friendly sustainable approach in wastewater treatment and disposal.
CO8. Maintain ethical standards for wastewater treatment and disposal following relevant IS Codes.
CO9. Communicate effectively on wastewater engineering problems in written and graphical forms.

DETAILED SYLLABUS:

UNIT – I: WASTEWATER COLLECTION AND DESIGN OF SEWERS (11 Periods)

Sanitation, Systems of sanitation – Dry conservancy and water carriage systems; Systems of sewerage, Sources of wastewater, Estimation of quantity of municipal wastewater and storm water, Different types of sewers, Design flows through sanitary sewers, Storm sewers and combined sewers, Hydraulic design of sewers, Sewer appurtenances, House drainage and plumbing systems.

UNIT – II: CHARACTERISTICS, PRELIMINARY AND PRIMARY TREATMENT OF SEWAGE (10 Periods)

Sewage Characteristics: Sampling of sewage, Characteristics of sewage – physical, Chemical and biological, Total solids, C.O.D, and B.O.D; Equation and factors affecting the BOD, Rate of reaction and population Equivalent - problems.

Preliminary and Primary Treatment of Sewage: Concept of sewage treatment - Primary, secondary and tertiary treatment, Conventional treatment process flow diagram of municipalwastewater treatment plant, Functions of each unit, Principles and design - Screens, Grit chamber, Primary settling tank.

UNIT – III: SECONDARY TREATMENT OF SEWAGE (08 Periods)

Principles of biological treatment, Nutritional requirement of biological treatment systems, Factors affecting biological treatment systems; Design, Construction, Operation and maintenance - Trickling filter, Rotating biological contactors, Activated sludge process, Oxidation ditch, Stabilization ponds.

UNIT – IV: TERTIARY TREATMENT, SLUDGE MANAGEMENT (08 Periods)

Tertiary Treatment: Removal of nitrogen, Phosphorus, Refractory organics, Heavy metals, Suspended solids and pathogenic bacteria.

Sludge Management: Sludge characteristics, Types and quantity; Sludge conditioning and dewatering, Sludge handling, Treatment, Utilization and disposal.

UNIT – V: EFFLUENT DISPOSAL (08 Periods)

Standards for disposal of effluent into surface water bodies, Self-purification of river, Zones of pollution - Dissolved oxygen sag curve, Streeter Phelps equation; Marine disposal, On land disposal systems – Overflow, Flooding, Irrigation; Onsite disposal system, Septic tank - Soak pits and dispersion trench systems.

Total Periods: 45

TEXT BOOKS:

1. Garg, S. K., *Environmental Engineering (Vol. II): Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, 27th Edition, 2013.
2. Birdie, G. S. and Birdie, J. S., *Water Supply and Sanitary Engineering*, Dhanpat Rai and Sons Publishers, 8th Edition, 2010.

REFERENCE BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering,* McGraw-Hill Inc., 1985.
2. Met Calf and Eddy, *Wastewater Engineering*, TMH Education Pvt. Ltd., 4th Edition, 2010.
3. Modi, P. N., *Sewage Treatment Disposal and Wastewater Engineering*, Standard Publishers Distributors, 3rd Edition, 2011
4. Punmia, B. C. and Ashok Jain, *Waste water Engineering*, Laxmi Publications, 2nd Edition, 2014.

III B.Tech. – I Semester
(16BT50441) PRINCIPLES OF IMAGE PROCESSING

(Interdisciplinary Elective -1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	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: On successful completion of the course, the students will be able to:

CO1. Demonstarte knowledge in
- a. Image Fundamentals
- b. Image Enhancement & Restoration Techniques
- c. Image Segmentation Techniques
- d. Morphological operations.
- e. Representation and description
- f. Pattern recognition

CO2. Analyze different images using various processing techniques.

CO3. Develop various image processing algorithms to process the images in various Real Time Applications.

CO4. Solve problems related to images for feasible and optimal solutions in the core area of Image Processing.

CO5. Apply appropriate techniques to restore degraded images in the field of image processing.

CO6. Understand the impact of the image processing for societal needs.

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

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*, 3rd Edition, Pearson Education, 2008.
2. Anil K. Jain, *Fundamentals of Digital Image Processing*, Prentice Hall, 2007.

REFERENCE BOOKS:

1. William K. Pratt, *Digital Image Processing*, John Wiley & Sons Inc. 3rd Edition, 2001.
2. Earl Gose, Richard Johnsonbaugh, and Steve Jost, *Pattern Recognition and Image Analysis*, Pearson Education Services Pvt. Ltd, 2015.

III B.Tech. – I Semester
(16BT5HS01) COSTING AND FINANCE MANAGEMENT FOR CIVIL ENGINEERS

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

PRE-REQUISITE: -

COURSE DESCRIPTION: Cost Planning; Contract Costing; Budgeting; Capital Budgeting; Estimation of Cash Flows; Working Capital Management.

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

CO1. Acquire knowledge in
- a) The basic concepts of finance
- b) Basic principles of costing
- c) Provides skills for effective utilization of costing concepts for quoting tenders
- d) Framing budgets in relation to construction

CO2. Develop skills in analyzing problems for
- a) Quoting tenders in relation to civil engineering
- b) Budgeting finance for construction industry
- c) Enhancing ability in calculating working capital requirement
- d) Improvising ability in estimating cash flows

CO3. Develop effective communication in relation to costing and finance

CO4. Design solutions for effective decisions in investment

DETAILED SYLLABUS:

UNIIT – I: COST PLANNING (09 Periods)

Cost predication and estimating in civil engineering projects – Approximate estimating – Preliminary estimating – Detailed estimating – Cost plan inclusions

UNIT – II: CONTRACT COSTING (10 Periods)

Meaning – Definition – Simple Contract Accounts – Comparative Contract Accounts – Contract Accounts with Balance Sheet – Estimation of Contracts (Simple problems)

UNIT – III: BUDGETING (08 Periods)

Concept of Budget – Classifications of Budgets – Considerations in preparing Budgets – Concept of Budgetary Control – Objectives and benefits of Budgetary Control – Essentials of a good Budgetary Control

UNIT – IV: CAPITAL BUDGETING (10 Periods)

Introduction – Nature of Capital Budgeting – Types of Capital Budgeting Decisions – Investment Evaluation Criteria – NPV – IRR – PI (simple problems)

Estimation of Cash Flows: Introduction – Cash Flows – Incremental Cash Flows – Capital and Depreciation for tax purpose

UNIT – V: WORKING CAPITAL MANAGEMENT (08 Periods)

Introduction – Concepts of Working Capital – Operating Cycle and Cash Conversions cycle – Determination of Working Capital – Sources of Working Capital Finance – Trade Credit – Accrued expenses and differed income – Bank Finance for Working Capital

Total Periods: 45

TEXT BOOKS:

1. S.P. Jain and K.L. Narang, *Cost Accounting*, Kalyani Publishers, Ludhiana, 12th Edition, 2008.
2. I.M. Pandey, *Financial Management*, Vikas Publishing House Pvt. Ltd., 11th Edition, 2015.

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, Cost and Management Study Material, New Delhi.
2. James C Van Horne and John M Wachowicz, *Fundamentals of Financial Management,* Prentice-Hall of India/Pearson, 13th Edition, 2009.

III B.Tech. – I Semester
(16BT50241) **RENEWABLE ENERGY**
(Interdisciplinary Elective-1)

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

PRE-REQUISITES: Courses on Engineering Physics and Basic Electrical and Electronics Engineering

COURSE DESCRIPTION: Various renewable energy sources; Different energy conversion techniques; Storage methods and applications.

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

CO1. Demonstrate knowledge on
- a) various renewable energy sources.
- b) different conversion techniques, energy storage methods and applications.

CO2. Analyze
- a) various solar energy collectors.
- b) horizontal and vertical axis windmills.
- c) ocean energy conversions
- d) various biogas digesters.

CO3. Design suitable accessories / controllers for desired operating conditions.

CO4. Explore relevant renewable sources to generate electrical power and provide valid solutions.

CO5. Assess societal and safetyissues and the consequent responsibilities relevant to therenewable sources engineering practice.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO ENERGY SOURCES **(09 Periods)**

Energy sources and their availability - conventional energy sources, renewable energy sources-solarenergy, windenergy, geothermal energy, ocean energy, biomass and biogas; Solar radiations-extraterrestrial and terrestrial; solar radiation geometry.

UNIT - II: SOLAR ENERGY (11 Periods)

Energy Collectors: Flat platecollector - liquid and air collectors; concentrating collectors- classification of concentrating collectors, advantages and disadvantages.

Energy Storage: Classification-thermal, electrical, chemical and mechanical energy storage, solar ponds.

Solar Applications: Solar water heating, space heating, space cooling, solar distillation, pumping, furnace, cooking and solar photovoltaics.

UNIT - III: WIND AND GEOTHERMAL ENERGY (09 Periods)

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance of wind machines, generating systems and environmental aspects.

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT - IV: OCEAN ENERGY (08 Periods)

OTEC, principles of utilization, setting of OTEC plants.

Tidal and Wave Energy: Conversion techniques, site requirements, mini and micro hydel power plants and their economics.

UNIT - V: BIOMASS (08 Periods)

Principles of bio-conversion, anaerobic/aerobic digestion, types of biogas digesters, gas yield, combustion characteristics of biogas, utilization for cooking, CI engine and SI engine operation.

Total Periods: 45

TEXT BOOKS:

1. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, 5th Edition, Delhi, 2011.
2. G.N. Tiwari and M.K. Ghosal, *Renewable Energy Resources: Basic Principles and Applications*, Alpha Science International Ltd., 2005.

REFERENCE BOOKS:

1. JhonTwidell and Tony Wier, *Renewable Energy Resources*, Taylor & Francis, 2nd Edition, London and Newyork, 2006.
2. K.M. Mittal, *Non-conventional Energy Systems-Principles*, Progress and Prospects, Wheeler Publications, 1997.
3. S.K. Dubey and S.K. Bhargava, *Non-conventional Energy Resources,* Dhanpat Rai & Co., 1st Edition, Delhi, 2011.

III B.Tech. – I Semester
(16BT70308) COMPUTATIONAL FLUID DYNAMICS

(Interdisciplinary Elective-1)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	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; Study flow analysis; Simple CFD techniques.

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

CO1. Demonstrate the knowledge of CFD techniques, basic aspects of discretization and grid generation in solving partial differential equations.
CO2. Analyze CFD problems and offer probable solutions using Finite Differential approach.
CO3. Develop mathematical models and flow simulations for CFD problems.
CO4. Conduct investigations on complex CFD problems using different techniques.
CO5. Apply modern flow simulation codes for solving governing equations of computational fluid dynamics.
CO6. Use CFD techniques for critical decision making in various applications in the society to eliminate the need for expensive and complex prototypes.

UNIT – I: GOVERNING EQUATIONS (09 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 (09 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 (09 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 (09 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.

UNIT – V: FINITE VOLUME METHOD (09 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.

TEXT BOOKS:

1. John. D. Anderson, *Computational Fluid Dynamics*, the Basics with Applications, McGraw-Hill, 6th Edition, 1995.
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
(16BT50131) COMPUTER AIDED BUILDING PLANNING AND DRAWING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	1	3	2

PRE-REQUISITES: Course on Building Materials and Construction Technology.

COURSE DESCRIPTION: Exercises on Conventional signs and symbols used in building; Planning and computer aided drawing of load bearing walls; RCC framed structures; Industrial buildings.

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

CO1. Explain knowledge on computer aided building drawing to develop the 2D and 3D views of structures using AutoCAD.

CO2. Analyze the given data for the developing the plans, elevations, cross-sectional view of the structures.

CO3. Design and develop the buildings plans, elevations, sectional views using AutoCAD.

CO4. Use appropriate drafting tools for developing the plans, elevation, sectional views using AutoCAD.

CO5. Utilize contextual knowledge for preparing the structural elements and building plans as per the engineering practice.

CO6. Follow building bye-laws and principles for promoting building plans, elevation, sectional views using AutoCAD.

CO7. Function effectively as an individual and as a team member to develop plan, elevation, cross sectional view of the structural elements and buildings using AutoCAD.

CO8. Communicate effectively on the building planning and drawing using AutoCAD in written, oral and graphical forms.

CO9. Promote cost effective building plans by management principles using AutoCAD.

DETAILED SYLLABUS:

SOFTWARE: AutoCAD

LIST OF EXERCISES:

1. Conventional signs in building drawing
2. Elevation and sectional view of windows and ventilators
3. Elevation and sectional view of doors
4. Isolated footings details.
5. Plan, elevation and sectional views of building (Load bearing wall structure)
6. Elevation and sectional view of RCC framed structures
7. North light roof truss details
8. King post truss details
9. Queen post truss 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, 10th Edition, 2008.
2. Balagopal and T. S. Prabhu, *Building Drawing and Detailing*, Spades Publishers, 1987.

REFERENCE BOOKS:

1. Shah, M. G., *Building Drawing*, Tata McGraw–Hill, 2007.
2. Kumaraswamy N. and KameswaraRao A., *Building Planning and Drawing*, Charotar Publishing, 4th Edition, 2010.
3. Kale and Patki, Shah, *Building Drawing with Integrated Approach to Built Environment*, Tata McGraw–Hill, 2002.
4. K. V. Natarajan, *A Text Book of Engineering Graphics*, N. Dhanalakshmi Publishers, 2015.

III B.Tech. – I Semester
(16BT50132) ENVIRONMENTAL ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Courses on Water Supply Engineering, Wastewater Technology.

COURSE DESCRIPTION: Experimental analysis of physical, chemical and biological parameters of water and wastewater.

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

CO1. Demonstrate the knowledge on experimental analysis of water and wastewater.
CO2. Analyse water and wastewater.
CO3. Solve complex problems associated with water and wastewater through proper investigations and interpretation of data.
CO4. Use appropriate techniques in the analysis of water and wastewater.
CO5. Provide solutions to the problems of water and wastewater ensuring health and safety.
CO6. Consider environmental sustainability in solving water and wastewater problems.
CO7. Follow standards in water and wastewater analysis.
CO8. Function effectively as an individual, and as a member or leader in teams to solve the water and wastewater problems.
CO9. Communicate effectively on water and wastewater analysis in written, oral and graphical forms.

LIST OF EXPERIMENTS:

1. Determination of pH, turbidity and electrical conductivity
2. Determination of colour
3. Determination of alkalinity and acidity
4. Determination of total suspended solids and total dissolved solids
5. Determination of total solids, volatile and fixed solids.
6. Determination of chlorides
7. Determination of iron and fluorides
8. Determination of optimum coagulant dose
9. Determination of residual chlorine
10. Determination of Dissolved Oxygen
11. Determination of B.O.D
12. Determination of C.O.D
13. Determination of nitrogen
14. Determination of total phosphorus
15. Determination of sulphates
16. Bacterial examination

III B. Tech. – I Semester
(16BT50133) GEOTECHNICAL ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	–	–	3	2

PREREQUISITES: Course on Soil Mechanics.

COURSE DESCRIPTION: Experiments on the determination of index properties and engineering properties of soil.

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

CO1. Demonstrate knowledge on laboratory testing of soils.
CO2. Analyze characteristics and engineering behavior of soils.
CO3. Conduct experiments on soils to find its suitability for any civil engineering construction.
CO4. Select an appropriate experimental method based on soil, ease of testing and application.
CO5. Establish soil properties with societal responsibility.
CO6. Give solutions to the problems of soil which are environmental friendly.
CO7. Follow IS Codes in soil testing.
CO8. Work effectively as an individual or in a group to determine soil properties.
CO9. Communicate effectively on soil properties in written, oral and graphical forms.

DETAILED SYLLABUS:

LIST OF EXPERIMENTS:

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 replacement method
6. Relative density test
7. Standard Proctor's compaction test
8. CBR Test
9. Permeability of soil – constant head test and variable head test
10. Consolidation test
11. Direct shear test
12. Unconfined compression test
13. Tri–axial compression test
14. Vane shear test

III B.Tech. – II Semester
(16BT60101) FOUNDATION ENGINEERING

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

PRE-REQUISITES: Course on Soil Mechanics.

COURSE DESCRIPTION: Soil exploration- Subsurface sampling and characterization methods; Lateral earth pressure; Earth retaining structures; Stability of earth slopes; Bearing capacity of shallow foundations; Pile foundations; Caissons and well foundations.

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

CO1. Acquire knowledge on geotechnical site investigation, types of footings, bearing capacity and settlement of shallow and deep footings.
CO2. Analyze soil exploration techniques, slopes; and footings for bearing capacity and settlements.
CO3. Decide and design all types of foundations.
CO4. Interpret the data obtained from soil investigations and suggest suitable foundation.
CO5. Select appropriate techniques to solve foundation engineering problems.
CO6. Consider safety measures in soil exploration, design and construction of foundations, earth slopes and retaining walls.
CO7. Perform soil exploration and design of footings as per IS Code.
CO8. Communicate effectively on foundation engineering problems in written and graphical forms.
CO9. Plan cost effective soil exploration programs.

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.

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 (10 Periods)

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.

Caissons and Well Foundations: Types of caissons, Bearing capacity, Construction, Advantages and disadvantages, Well foundations - Shapes, Components, Sinking, Tilts and shifts.

Total Periods: 45

TEXT BOOKS:

1. C. Venkatramaiah, *Geotechnical Engineering,* New Age International Publishers, 3rd Edition, 2010.
2. K. R. Arora, *Soil Mechanics and Foundation Engineering*, Standard Publishers and Distributors, 7th Edition, 2010.

REFERENCE BOOKS:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundations*, Laxmi Publications Pvt. Ltd., 16th Edition, 2005.
2. Gopal Ranjan and A. S. R. Rao, *Basic and Applied Soil Mechanics,* New Age International Pvt. Ltd., 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.

III B.Tech. – II Semester
(16BT60102) HIGHWAY AND TRAFFIC ENGINEERING

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

PRE-REQUISITES: Courses on Surveying, Soil Mechanics.

COURSE DESCRIPTION: Highway development and planning; Highway geometric design; Highway materials; Pavement design; Traffic engineering; Traffic measurement and analysis; Highway capacity; Traffic regulation, control and control devices.

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

CO1. Demonstrate knowledge on highway and traffic engineering.
CO2. Analyze highway materials, pavements, traffic and parking facilities.
CO3. Design highway geometry, pavements and traffic signals.
CO4. Provide solutions to complex highway and traffic engineering problems through investigations.
CO5. Use appropriate methods to assess highway materials, traffic; and design pavements.
CO6. Follow IS and IRC Codes in the design of highway and traffic engineering systems.
CO7. Maintain ethical standards for quality in highway and traffic engineering practice.
CO8. Communicate effectively on highway and traffic engineering in written and graphical forms.

DETAILED SYLLABUS:

UNIT - I: HIGHWAY DEVELOPMENT, PLANNING AND GEOMETRIC DESIGN (10 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: HIGHWAY MATERIALS AND PAVEMENT DESIGN (09 Periods)

Highway Materials: Soil, Aggregates and bitumen – Desirable properties, Tests on subgrade soil – CBR test, Tests on aggregate and bitumen; Specifications, 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's stress analysis, Computing radius of relative stiffness and equivalent radius of resisting section, Stresses in rigid pavements, Design of expansion and contraction joints in CC pavements, Design of dowel bars and tie bars.

UNIT - III: TRAFFIC ENGINEERING (08 Periods)

Traffic Engineering: 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.

Traffic Characteristics: Basic characteristics of traffic - Human characteristics, Vehicle characteristics - Volume, Speed and density, Relationship among traffic parameters.

UNIT - IV: TRAFFIC MEASUREMENT, ANALYSIS AND HIGHWAYCAPACITY (09 Periods)

Traffic Measurement: Traffic volume studies – Objectives, Types; Concept of PCU, Data collection and presentation, Speed studies – Objectives, Types, Methods; Data collection and presentation, Origin and destination studies, Pedestrian studies, Basic principles of traffic flow.

Highway Capacity: Definition and Importance, Factors, Levels of service – Concept, Types; Concept of service volume.

UNIT - V: PARKING FACILITIES, TRAFFIC REGULATION, CONTROL AND CONTROL DEVICES (09 Periods)

Parking Facilities: Types of parking facilities, Parking studies, Analysis of parking data and parking characteristics, Design standards.

Traffic Regulation and Control: Traffic problems in urban areas, Accident studies and analysis, Traffic control measures – Channelization, Principle and design of intersections, grade separations and interchanges; Traffic control aids and street furniture and lighting.

Traffic Control Devices: Traffic signs - Types, Specifications; Traffic signals – Signal design, Computer applications in signal design; Traffic Islands – Channelizing islands; Pavement markings – Types, Specifications.

Total Periods: 45

TEXT BOOKS:

1. Khanna, S. K., Justo, C. E. G. and Veeraragavan, A., *Highway Engineering, Nem* Chand & Bros, Roorkee, Revised 10th Edition, 2014.
2. Kadiyali, L. R., *Traffic Engineering and Transport Planning,* Khanna Technical Publications, Delhi, 7th Edition, 2010.

REFERENCE BOOKS:

1. Jotin Khisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction,* Prentice Hall of India Pvt. Ltd., 3rd Edition, 2006.
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,* Prentice Hall of India Pvt. Ltd., 2006.
4. Mannering, F. L. and Washburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley & Sons, Inc., 5th Edition, 2013.

CODES:

1. IRC: 37-2012: Guidelines for the Design of Flexible Pavements, Third Revision, Indian Roads Congress, New Dellhi,
2. IRC: 58-2015: Guidelines for the Design of Plain Jointed Rigid Pavements for Highwways, Indian Roads Congress, New Dellhi, **are to be permitted into the examination hall.**

III B.Tech. – II Semester
(16BT60103) **STEEL STRUCTURES**

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

PRE-REQUISITES: Courses on Engineering Mechanics, Mechanics of Solids, Structural Analysis-I, Structural Analysis-II.

COURSE DESCRIPTION: Bolted connections; Welded connections; Beams; Tension members; Compression members; Built-up Compression members; Column foundations, Roof trusses; Tubular trusses.

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

CO1. Attain the basic knowledge on design of steel structures and their elements by limit state method.
CO2. Analyze the steel structures and their elements.
CO3. Design steel structures and their elements.
CO4. Provide solutions to complex engineering problems associated with steel construction through proper analysis and design.
CO5. Use appropriate techniques to analyze and design of steel structures and their elements.
CO6. Ensure safety and stability in the design of steel structures and their elements.
CO7. Follow IS codes in the design of steel structures and their elements.

DETAILED SYLLABUS:

UNIT - I: BOLTED AND WELDED CONNECTIONS (10 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 (9 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 (8 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, Connections.

Total Periods: 45

TEXT BOOKS:

1. S. S. Bhavikatti, *Design of Steel Structures*, I. K. International Publishing House Pvt. Ltd., 3rd Edition, 2010.
2. S. K. Duggal, *Limit State Design of Steel Structures*, Mc.Graw Hill, 2nd Edition, 2014.

REFERENCE BOOKS:

1. N. Subramanian, *Design of Steel Structures*, Oxford University Press, 2010.
2. N. Krishna Raju, *Structural Design and Drawing*, Universities Press, Hyderabad, 3rd Edition, 2009.
3. S. Ramachandra, *Design of Steel Structures*, Dhanpat Rai Publishing Company, 2nd Edition, 2007.
4. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Design of Steel Structures,* Laxmi Publications, 2nd Edition, 2013.

CODES/TABLES:

1. IS: 800–2007: General Construction in Steel – Code of Practice,
2. IS: 875– Part III: Code of Practice for Design Loads (Other than Earthquake) For Buildings and Structures,
3. IS: 1161-1998: Steel Tubes for Structural Purposes – Specifications,
4. Steel Tables, **are to be permitted into the examination hall.**

III B.Tech. – II Semester

(16BT40502) DATABASE MANAGEMENT SYSTEMS

(Common to CE & ECE)
(Interdisciplinary Elective-2)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Database Systems; Database Design; Relational Model; SQL Queries, Constraints and Triggers; Schema Refinement and Normal Forms; Transaction Management; Concurrency Control; Overview of Storage and Indexing.

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

CO1. Demonstrate knowledge on
  a) Data models and Database Languages
  b) Database design
  c) Normal forms
  d) Storage and Indexing
CO2. Analyze databases using normal forms to provide solutions for real time applications.
CO3. Design solutions for database problems using database design, views design and framing queries.
CO4. Use database techniques for designing databases, managing databases and its security.
CO5. Select SQL, Hash based Indexing and Tree based Indexing to manage data in databases.
CO6. Apply contextual knowledge to develop database applications related to societal applications like Information Retrieval Systems, Banking and Financial systems.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO DATABASE SYSTEMS & DATABASE DESIGN (9 Periods)

Database Systems: Database system applications, Purpose of database systems, View of data-Data abstraction, Instances and Schemas, Data models; Database languages - DDL, DML; Database architecture, Database users and administrators.

Database Design: ER diagrams, Beyond ER design, Entities, Attributes and entity sets, Relationships and relationship sets, Additional features of ER model, Conceptual design with ER model.

UNIT - II: THE RELATIONAL MODEL & RELATIONAL ALGEBRA AND CALCULUS (8 Periods)

Relational Model: Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design,

Introduction to views, Destroying/altering tables and views.
Relational Algebra and Calculus: Preliminaries, Relational Algebra operators; Relational Calculus - Tuple and Domain Relational Calculus; Expressive power of Algebra and calculus.

UNIT - III: SQL & SCHEMA REFINEMENT (10 Periods)
SQL: Form of basic SQL query- Examples of basic SQL queries; Nested queries- Introduction to nested queries, Correlated nested queries, Set-comparison operators; Aggregate operators, NULL values-Comparison using NULL values, Logical connectives AND, OR and NOT, Impact on SQL constructs, Outer joins, Disallowing NULL values; Complex integrity constraints in SQL ,Triggers and active databases.
Schema Refinement: Problems caused by redundancy, Decompositions, Problem related to decomposition, Functional dependencies, Reasoning about FDS, Normal forms – First, second and third normal forms, BCNF; Multi valued dependencies, Fourth normal form, Join dependencies, Fifth normal form.

UNIT - IV: TRANSACTIONS AND CONCURRENCY CONTROL (9 Periods)
Transactions: Transaction concept, Transaction state, Implementation of atomicity and durability, Concurrent executions, Serializability, Recoverability, Implementation of isolation, Testing for serializability.
Concurrency Control: Lock based protocols, Timestamp based protocols, Validation based protocols, Multiple granularity, Deadlock handling.

UNIT - V: STORAGE AND INDEXING (9 Periods)
Storage and Indexing: Data on external storage, File organization and indexing – Clustered indexes, Primary and secondary indexes; Index data structures – Hash based indexing, Tree based indexing; Comparison of file organizations.
Tree Structured Indexing: Intuition for tree indexes, Indexed Sequential Access Method (ISAM), B+ Trees- A dynamic index structure; Search, Insert, Delete; B-Tree index files.

Total Periods: 45

TEXT BOOKS:

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, Tata McGraw-Hill, Third Edition, 2014.
2. A. Silberschatz, H.F.Korth and S. Sudarshan, *Database System Concepts*, Tata McGraw-Hill, Fifth Edition, 2006.

REFERENCE BOOKS:

1. Ramez Elmasri and Shamkant B. Navathe, *Database Systems*, Pearson Education, Sixth Edition, 2013.
2. Peter Rob and Carlos Coronel, *Database Systems Design, Implementation and Management*, Cengage Learing, Seventh Edition, 2009.

III B.Tech. – II Semester

(16BT50341) OPTIMIZATION TECHNIQUES

(Common to CSE, CSSE & CE)
(Interdisciplinary Elective-2)

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

PRE-REQUISITES: A course on Multi-variable Calculus and Differential Equations

COURSE DESCRIPTION: Introduction to optimization; Classical optimization techniques; Classification of optimization problems; Linear programming; transportation and assignment problem; Non-linear programming; Un-constrained non-linear programming; Constrained non-linear programming; Dynamic programming.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

CO1. Demonstrate the knowledge on Optimization techniques for Linear, Nonlinear and Dynamic programming problems.
CO2. Analyze and quantify a system architecture or product design problem for selecting appropriate objective function, design variables, parameters and constraints.
CO3. Develop mathematical models for real time optimization problems.
CO4. Conduct investigations on complex problems and make recommendations based on solutions, analysis and limitations of models.
CO5. Use optimization techniques for solving complex problems of real time applications.
CO6. Optimize the resources in organizations for sustainable development.

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, Graphical solution, Simplex method, Big M-method, Two–phase method, Duality principle, Dual simplex method.

Unit - III: TRANSPORTATION AND ASSIGNMENT PROBLEMS (09 Periods)

Transportation problems: Formulation, Initial basic feasible solution - North–West corner rule, Least cost method, and Vogel's approximation method; Optimal solution using Modified distribution method - Unbalanced transportation problem, Degeneracy.

Assignment Problems: Formulation, Solution of assignment problem and its variants, Traveling salesman problem.

Unit – IV: 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 – V: 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.

Total Periods: 45

TEXT BOOKS:

1. Singiresu S Rao, *Engineering Optimization: Theory and Practice*, New Age International, 3rd Edition, 2010.
2. A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, *Engineering Optimization: Methods and Applications*, Wiley India Pvt. Ltd., 2nd Edition2006.

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, 9th edition, 2013.

III B.Tech. – II Semester

(16BT60104) FIRE ENGINEERING

(Interdisciplinary Elective-2)

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

PRE-REQUISITES: Courses on Engineering Chemistry, Building Materials and Construction 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: On successful completion of this course, the students will be able to:

CO1. Acquire the knowledge on fire characteristics, fire detection, fire protection and explosion protection.
CO2. Analyze fire characteristics, fire detection systems, fire and explosion protection systems.
CO3. Design building elements and develop fire and explosion protection systems.
CO4. Solve fire engineering problems through proper investigation and interpretation.
CO5. Use appropriate techniques to solve fire engineering problems.
CO6. Ensure health and fire safety in solving fire engineering problems.
CO7. Consider environmental sustainability in fire and explosion protection systems.
CO8. Follow rules and regulations in fire engineering practice.
CO9. Prepare layouts and diagrams in fire engineering.
CO10. Manage effectively fire and explosion protection systems.

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 (09Periods)

Sources of ignition, Fire triangle, Principles of fire extinguishing, Various classes of fires – A, B, C, D & E, Types of fire extinguishers, Fire stoppers, Alarm and detection systems, Fire station - Fire alarms and sirens, Maintenance of fire trucks,

Foam generators, 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, Fire fighting systems.

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, Snookers.

UNIT - V: EXPLOSION PROTECTING SYSTEMS (09 Periods)

Principles of explosion, Detonation and blast waves, Explosion parameters, Explosion Protection, Containment, Flame Arrestors, Isolation, Suppression, Venting, 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 (NH3), sulphur dioxide (SO2), chlorine (CL2) etc.

Total Periods: 45

TEXT BOOKS:

1. V. K. Jain, *Fire Safety in Buildings,* New Age international Publishers, 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 1977.
2. S. Rao, R. K. Jain 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*, John Wiley and Sons Ltd., 1983.
5. Derek W. B. James, *Fire Prevention Hand Book*, Butter Worths and Company, 1986.

III B.Tech. – II Semester
(16BT60241) ENERGY AUDIT AND CONSERVATION
(Interdisciplinary Elective – 2)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of energy audit and conservation; Energy efficiency in buildings; Energy efficient motors, lighting, instruments and significance of energy economics.

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

CO1. Demonstrate knowledge on auditing practices, conservation measures and economics of energy.
CO2. Analyze auditing practices, conservation measures and economics of energy.
CO3. Design an appropriate energy conservation measures in commercial and industrial applications.
CO4. Provide feasible solutions for problems associated with energy auditing and conversion through proper investigation and interpretation of data.
CO5. Use appropriate techniques for energy auditing and conservation.
CO6. Solve energy auditing and conservation problems with societal relevance.
CO7. Consider environment and sustainability in energy auditing and conservation.
CO8. Follow relevant rules and regulations in practicing energy audit and conservation.
CO9. Communicate effectively on energy audit in written and graphical forms.
CO10. Consider financial issues in energy audit and conservation.

DETAILED SYLLABUS:

UNIT - I: ENERGY AUDIT PRINICPLES (09 Periods)
Energy audit - Definitions, Concept, Types of audit, Energy index, Cost index, Pie charts, Sankey diagrams; Load profiles, Energy audit of industries, Energy saving potential, Energy audit of process industry, Building energy audit, IE rules and regulations for energy audit.

UNIT - II: ENERGY CONSERVATION PRINCIPLES (09 Periods)
Rules for efficient energy conservation, Technologies for energy conservation, Energy scenario, Principles of energy conservation, Resource availability, Energy savings, Current energy consumption in India, Roles and responsibilities of energy managers in industries.

UNIT - III: ENERGY EFFICIENCY IN BUILDINGS (11 Periods)

Introduction, Definition and concepts, Energy and water as a resource - Heating, Ventilating and Air conditioning systems; Energy economic analysis, Domestic energy consumption, Savings, Energy use in buildings, Residential and commercial buildings, Green buildings, Smart buildings, Rating of buildings, Efficient use of buildings, Solar passive architecture, Eco-housing concepts.

UNIT – IV: ENERGY AUDIT INSTRUMENTS AND ENERGY EFFICIENT MOTORS (08 Periods)

Energy Audit Instruments: Watt meter, Data loggers, Thermocouples, Pyrometers, Lux meters, Tongue testers, PLCs and applications.

Energy Efficient Motors: Factors affecting efficiency, Loss distribution, Constructional details, Characteristics, Variable speed, Variable duty cycle systems, Applications of life cycle costing analysis, Return on investment.

UNIT - V: ECONOMIC ASPECTS AND ANALYSIS (08 Periods)

Economic concepts, Computation of economic aspects calculation of simple payback method, Net present worth method, Depreciation Methods, Time value of money, Rate of return, Present worth method, Replacement analysis, Life cycle costing analysis.

Total Periods: 45

REFERENCE BOOKS:

1. Ashok V. Desai, Wiley Eastern, *Energy Demand – Analysis, Management and Conservation Hand Book on Energy Auditing* - TERI (Tata Energy Research Institute), 2005.
2. Albert Thumann, William J. Younger, *Handbook of Energy Audits*, Taylor & Francis Ltd, 7th Edition, 2008.
3. Ashok V. Desai, Wiley Eastern, *Energy Demand – Analysis, Management and Conservation* Hand Book on Energy Auditing - TERI (Tata Energy Research Institute), 2005.
4. Dale R. Patrick, Stephen W. Fardo, Ray E. Richardson, Steven R. Patrick, *Energy Conservation Guide Book*, Taylor & Francis Ltd, 2nd Edition,2007.
5. Ashok V.Desai, *Energy Economics,* Wiley Eastern, 1st Edition, 1990.
6. *Industrial Energy Conservation Manuals*, Cambridge, MIT Press, 1982.
7. Frank Kreith, Ronald E. West, *Handbook of Energy Efficiency,* CRC Press, 1st Edition, 1996.
8. *Energy Efficiency In Buildings,* CIBSE Guide F, 3rd Edition, May, 2012.
9. Nilesh Y. Jadhav, *Green and Smart Buildings: Advanced Technology Options*, Springer Science Business Media, Singapore, 2016.

III B.Tech. – II Semester
(16BT60105) ADVANCED REINFORCED CEMENT CONCRETE STRUCTURES

(Program Elective – 1)

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

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Engineering Mechanics, Mechanics of Solids, Structural Analysis – I, Structural Analysis – II, Reinforced Cement Concrete Structures.

COURSE DESCRIPTION: Foundations; Flat slabs; Water tanks; Retaining walls; Bunkers; Silos; Chimneys.

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

CO1. Demonstrate the knowledge concepts, techniques and applications of design of reinforced cement concrete structures; foundations, flat slabs, water tanks, retaining walls, bunkers, silos, chimneys.
CO2. Analyze different reinforced cement concrete structures.
CO3. Design different reinforced cement concrete structures.
CO4. Recommend suitable structural elements for reinforced cement concrete structures
CO5. Use appropriate method to design RCC structures.
CO6. Ensure the RCC design as per safety and serviceability requirements.
CO7. Uphold Ethics in RCC design

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 - IV: MISCELLANEOUS STRUCTURES **(09 Periods)**

Design of Bunkers, Silos, Chimneys.

Total Periods: 45

TEXT BOOKS:

1. S. Unnikrishna Pillai and Devdas Menon, *Reinforced Concrete Design*, Tata Mc. Graw Hill, 3rd Edition, 2010.
2. S. K. Roy and N. C. Sinha, *Fundamentals of Reinforced Concrete*, S. Chand & Company Ltd., 5th Edition, 2010.

REFERENCE BOOKS:

1. N. Krishna Raju and R. N. Pranesh, *Reinforced Concrete Design*, CBS Publishers Distributors, 3rd Edition, 2010.
2. P. C. Varghese, *Limit State Designed of Reinforced Concrete*, Prentice Hall of India, 2nd Edition, 2010.
3. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Reinforced Concrete structures – Vol. I*, Laxmi Publications Pvt. Ltd., 19th Edition, 2010.
4. M. L. Gambhir, *Fundamentals of Reinforced Concrete Design,* Printice Hall of India Pvt. Ltd., 2010.

CODES:

1. IS: 456–2000: Plain and Reinforced Concrete,
2. IS: 3370-2009: Concrete Structures for Storage Of Liquids,
3. IS: 4995 (I & II): Criteria for Design of Reinforced Concrete Bins for the Storage of Granular and Powdery Materials, **are to be permitted into the examination hall.**

III B.Tech. – II Semester
(16BT60106) ADVANCED STRUCTURAL ANALYSIS

(Program Elective - 1)

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

PRE-REQUISITES: Courses on Structural Analysis – I, Structural Analysis –II.

COURSE DESCRIPTION: Arches: two and three hinged arches; Portal frames; Flexibility method; Stiffness method; Curved beams.

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

CO1. Demonstrate the knowledge on the analysis of arches, portal frames, beams (flexibility and stiffness methods) and curved beams.
CO2. Analyze arches, portal frames, beams and curved beams.
CO3. Solve complex problems in analyzing arches, portal frames, beams and curved beams for different loading.
CO4. Select appropriate technique for analyzing arches, portal frames, beams and curved beams.
CO5. Ensure safety in the analysis of arches, portal frames, beams and curved beams.
CO6. Present the results of analysis such as bending moment, shear force effectively in written and graphical forms.

DETAILED SYLLABUS

UNIT – I: ARCHES (10 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.

UNIT – II: PORTAL FRAMES AND APPROXIMATE METHODS (09 Periods)

Portal Frames: Substitute frame method for vertical loads, Analysis for portal frames.

Approximate Methods: Portal method and cantilever method for lateral loads.

UNIT - III: FLEXIBILITY METHOD (09 Periods)

Flexibility coefficients, Flexibility matrices, Sign convention, Application to continuous beams, Temperature stresses, Lack of fit, Support settlements.

UNIT – IV: STIFFNESS METHOD (09 Periods)

Stiffness coefficients, Stiffness matrices, Application to continuous beams, Effect of support displacements, Temperature stresses.

UNIT – V: BEAMS CURVED IN PLAN (08 Periods)

Circular beams loaded uniformly and supported on symmetrically placed columns, Semi–circular beams simply supported on three equally spaced supports.

Total Periods: 45

TEXT BOOKS:

1. Thandavamoorthy, T. S., *Structural Analysis*, Oxford University Press, 5th Edition, 2011.
2. Ramamrutham, S. and Narayanan, R., *Theory of Structures*, Dhanpat Rai Publishing Co. Ltd., 9th Edition, 2014.

REFERENCE BOOKS:

1. H. J. Shah and S. B. Junnarkar, *Mechanics of Structures – Vol. II*, Charotar Publishing House, 21st Edition, 2010.
2. Pandit, G., Gupta, S. and Gupta, R., *Theory of Structures – Vol. II*, Tata Mc–Graw Hill Publishing Co. Ltd., 1st Edition, 1999.
3. Punmia, B. C., Ashok Kumar Jain and Arun Kumar Jain, *SMTS–II – Theory of Structures*, Laxmi Publications (P) Ltd.,12th Edition, 2004.
4. R. S. Khurmi, *Theory of Structures*, S. Chand & Company Ltd., 22nd Edition, 2010.

III B.Tech. – II Semester

(16BT60107) **ADVANCED SURVEYING**

(Programme Elective – 1)

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

PRE-REQUISITES: Courses on Matrices and Numerical Methods, Engineering Physics, Surveying.

COURSE DESCRIPTION: Astronomical surveying; Construction and boundary surveys; Theory of errors; Land surveys; Triangulation and baseline measurements; GPS surveying.

COURSE OUTCOMES: On successful completion of this course, the students will able to:

CO1. Demonstrate the knowledge on advanced surveying techniques.
CO2. Analyze advanced surveying techniques, tools and survey data.
CO3. Prepare survey maps.
CO4. Solve complex engineering survey problems through proper survey and interpretation.
CO5. Use appropriate modern tools in advanced surveying practice.
CO6. Follow ethics in surveying practice.
CO7. Communicate effectively on advanced surveying issues in written and graphical forms.

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 (09 Periods)

Equipment for construction surveys, Setting out pipe line, Setting out buildings and structures, Setting out a highway.

UNIT-III: THEORY OF ERRORS AND LAND SURVEYS (10 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 (10 Periods)

Principle and classification of triangulation 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 (08 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.

Total Periods: 45

TEXT BOOKS:

1. Arora, K. R., *Surveying – Vol. III,* Standard Book House, 11th Edition, 2013.
2. A. M. Chandra, Higher *Surveying,* New Age International (P) Limited, Publishers, 3rd Edition, 2015.

REFERENCE BOOKS:

1. S. K. Duggal, *Surveying – Vol. I and II*, Tata McGraw–Hill Publishing Co. Ltd., 4th Edition, 2013.
2. Arthur R. Benton and Philip J. Taetz, *Elements of Plane Surveying,* McGraw-Hill, 3rd Edition, 2010.
3. B. C. Punimia, Ashok K. Jain and Arun K. Jain, *Surveying – Vol. II,* Laxmi publications(P) Ltd., 17th Edition, 2016.
4. T. P. Kanetkar and S. V. Kulakarni, *Surveying and Leveling*, Pune Vidyarthi Griha Prakashan, Pune, 24th Edition, 2013.

III B.Tech. – II Semester

(16BT60108) GEOENVIRONMENTAL ENGINEERING

(Program Elective – 1)

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

PREREQUISITES: Courses on Soil Mechanics, Environmental Engineering.

COURSE DESCRIPTION: Fundamentals of geoenviromental engineering; Soil–water–contaminant interaction; Waste containment system; Contaminant site remediation; Advanced soil characterization.

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

CO1. Acquire knowledge on fundamentals of geoenvironmental engineering, site characterization, waste containment systems and remediation.
CO2. Characterize contaminated site and analyze waste containment systems and remediation techniques.
CO3. Design waste containment systems and remediation techniques.
CO4. Solve complex geoenvironmental problems through proper investigations.
CO5. Use appropriate techniques for site characterization and remediation.
CO6. Propose geoenvironmental solutions considering health and safety issues.
CO7. Protect environment through sustainable remediation techniques.
CO8. Follow ethics in geoenvironmental engineering practice.

DETAILED SYLLABUS:

UNIT – I: FUNDAMENTALS OF GEOENVIROMENTAL ENGINEERING (09 Periods)

Scope of geoenvironmental engineering, Multiphase behavior of soil, Role of soil in geoenvironmental applications, Importance of Soil physics, Soil chemistry, Hydrogeology, Biological process; Sources and type of ground contamination, Impact of ground contamination on geoenvironment, Case histories on geoenvironmental problems.

UNIT – II: SOIL–WATER–CONTAMINANT INTERACTION (09 Periods)

Soil mineralogy characterization and its significance in determining soil behavior, Soil–water interaction and concepts of double layer, Forces of interaction between soil particles, Concepts of unsaturated soil, Importance of unsaturated soil

in geoenvironmental problems, Measurement of soil suction, Water retention curves, Water flow in saturated and unsaturated zone, Soil–water–contaminant interactions and its implications, Factors affecting retention and transport of contaminants.

UNIT – III: WASTE CONTAINMENT SYSTEM

(09 Periods)

Evolution of waste containment facilities and disposal practices, Site selection based on environmental impact assessment, Different roles of soil in waste containment, Different components of waste containment system and its stability issues, Property evaluation for checking soil suitability for waste containment, Design of waste containment facilities.

UNIT – IV: CONTAMINANT SITE REMEDIATION

(09 Periods)

Site characterization, Risk assessment of contaminated site, Soil remediation technologies– Soil vapor extraction, Soil washing, Stabilization/solidification, Electrokinetic 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: ADVANCED SOIL CHARACTERIZATION

(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.

Total Periods: 45

TEXT BOOKS:

1. Reddi, L. N. and Inyang, H. I., *Geoenvironmental Engineering Principles and Applications*, Marcel. Dekker, Inc., 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, 2004.

REFERENCE BOOKS

1. Rowe, R. K., *Geotechnical and Geoenvironmental Engineering Handbook*, Kluwer Academic, 2001.
2. Yong, R. N., *Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation*, CRC Press, New York, 2001.
3. Phillip B. Bedient, Refai, H. S. and Newell, C. J., *Ground Water Contamination*, Prentice Hall Publications, 4th Edition, 2008
4. LaGrega, M. D., Buckingham, P. L. and Evans, J. C., *Hazardous Waste Management*, McGraw–Hill, 2001.

III B.Tech. – II Semester

(16BT60109) GROUNDWATER DEVELOPMENT AND MANAGEMENT

(Program Elective – 1)

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

PRE-REQUISITES: Courses on Engineering Hydrology, Engineering Geology, Irrigation Engineering.

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

CO1. Demonstrate the knowledge on ground water occurrence, exploration, movement, pollution, and recharge methods.
CO2. Analyze problems associated with occurrence, pumping test data, artificial recharge and exploration of groundwater and saline water intrusion.
CO3. Design and develop artificial groundwater recharge sites using various techniques.
CO4. Conduct investigations on occurrence of groundwater and saline water intrusion in a basin.
CO5. Use appropriate tools and techniques in exploration, development and management of groundwater.
CO6. Solve groundwater issues related to saline water intrusion considering societal issues.
CO7. Consider environmental sustainability in solving groundwater problems.

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.

UNIT - IV: ARTIFICIAL RECHARGE OF GROUNDWATER (08 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.

Total Periods: 45

TEXT BOOKS:

1. H. M. Raghunath, *Groundwater*, Wiley Eastern Ltd., 3rd Edition, 2009.
2. David Keith Todd, *Groundwater Hydrology*, Wiley India Pvt. Ltd., 2nd Edition, 2010.

REFERENCE BOOKS:

1. K. R. Karanth, *Groundwater Assessment, Development and Management*, TMH, 2003.
2. R. Willis and W. W. G. Yeh, *Groundwater System Planning and Management*, PHI, 1987.
3. V. C. Agarwal, *Groundwater Hydrology*, PHI, 2012.
4. Bhagu R. Chahar, *Groundwater Hydrology*, Mc. Graw Education Pvt. Ltd., 2014.

III B.Tech. – II Semester
(16BT60110) SOLID WASTE MANAGEMENT
(Program Elective - 1)

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

PREREQUISITES: Course on Environmental Studies

COURSE DESCRIPTION: Sources and types of municipal solid wastes; Onsite handling; Storage and processing; Collection and transfer; Off sites processing; Disposal.

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

CO1. Demonstrate the knowledge on sources, characterization, collection, segregation, transportation, storage, off-site processing and disposal of solid waste.
CO2. Analyze characteristics; collection, transportation, storage, processing and disposal methods of solid waste.
CO3. Design of solid waste disposal systems.
CO4. Investigate and interpret data to recommend suitable solutions to solid waste management.
CO5. Use appropriate techniques for solid waste management.
CO6. Consider health and safety in solid waste management.
CO7. Ensure environmental sustainability in solid waste management.
CO8. Follow environmental acts in solid waste management.
CO9. Provide economically viable solid waste management solutions.

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, Effects of improper disposal of solid wastes, 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 PROCESSING (08 Periods)

Processing techniques and equipment, Resource and energy recovery from solid wastes – Composting, Incineration and pyrolysis.

UNIT – V: DISPOSAL (10 Periods)

Dumping of solid waste, Sanitary landfills – Site selection, Design and operation of sanitary landfills, Leachate collection and treatment; Biomedical waste management – Incineration and pyrolysis.

Total Periods: 45

TEXT BOOKS:

1. T. V. Rama Chandra, *Management of Municipal Solid Waste*, 2011.
2. B. Bilitewski, G. HardHe, K. Marek, A. Weissbach, and H. Boeddicker, *Waste Management*, Springer, 1994.

REFERENCE BOOKS:

1. George Tchobanoglous, Hilary Theisen and Samuel A. Vigil., *Integrated Solid Waste Management: Engineering Principles and Management Issues*, McGraw–Hill Publishers, 2002.
2. *Manual on Municipal Solid Waste Management*, CPHEEO, Ministry of Urban Development, Government of India, 2000.
3. Bhide, A. D. and Sundaresan, B. B., *Solid Waste Management in Developing Countries*, INSDOC, 2010.
4. G. Burke, B. R. Singh and L. Theodore, *Handbook of Environmental Management and Technology*, John Wiley & Sons, 2nd Edition, 2000.

III B.Tech. – II Semester
(16BT60111) STRUCTURAL HEALTH MONITORING
(Program Elective –1)

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

PRE-REQUISITES: Courses on Basic Electrical and Electronics Engineering, Concrete Technology.

COURSE DESCRIPTION: Structural health monitoring; Non destructive testing of concrete structures; Sensors for health monitoring systems; SHM Techniques and systems; Information technology for health monitoring; SHM Applications in civil engineering.

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

CO1. Acquire the fundamental knowledge on structural health monitoring and its applications.
CO2. Analyze smart materials, civil engineering structures and techniques for health monitoring.
CO3. Recommend suitable solutions for structural health monitoring.
CO4. Implement the modern tools and techniques in structural health monitoring.
CO5. Ensure health and safety of the structures through structural health monitoring systems.
CO6. Understand the impacts of the structural heath monitoring on environment and sustainability.
CO7. Follow ethics in choosing and implementing structural heath monitoring systems and techniques.

DETAILED SYLLABUS:

UNIT - I: STRUCTURAL HEALTH MONITORING (08 Periods)

Need for SHM, SHM - A way for smart materials and structures, SHM and bio mimetic - 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: NON DESTRUCTIVE TESTING OF CONCRETE STRUCTURES (10 Periods)

Situations and contexts, Need, Classification of NDT procedures, Visual inspection, Half-Cell electrical potential methods, Schmidt rebound hammer test, Resistivity measurement, Electromagnetic methods,

Radiographic testing, Ultrasonic testing, Infrared thermography, Ground penetrating radar, Radio isotope gauges, Other methods.

UNIT - III: SENSORS FOR HEALTH MONITORING SYSTEMS (09 Periods)

Acoustic emission sensors, Ultrasonic sensors, Piezoceramic sensors and actuators, Fibre optic sensors and Laser shearography techniques, Imaging techniques.

UNIT - IV: SHM TECHNIQUES AND SYSTEMS (09 Periods)

Diagnostic Techniques: Vibration signature analysis, Modal analysis, Neural network-based classification techniques.

Integrated Health Monitoring Systems: Intelligent health monitoring techniques, Neural network classification techniques, Extraction of features from measurements, Training and simulation techniques, Connectionist algorithms for anomaly detection, Multiple damage detection and case studies.

UNIT - V: IT FOR SHM AND SHM APPLICATIONS IN CIVIL ENGINEERING (09 Periods)

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.

SHM Applications in Civil Engineering: Capacitive methods, Capacitive probe for cover concrete, SHM of a bridge, Applications for external post tensioned cables, Monitoring historical buildings.

Total Periods: 45

REFERENCE BOOKS:

1. Daniel Balageas, Claus-Peter Fritzen and Alfredo Guemes, *Structural Health Monitoring*, Published by 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.
3. M. L. Wang, J. P Lynch and H. Sohn, *Sensors Technologies for Civil Infrastructure*, Vol.1 & 2, Wood Head Publishing Limited, Cambridge, 2009.
4. Philip, W., *Industrial Sensors and Applications for Condition Monitoring*, MEP, 1994.
5. Armer, G. S. T (Editor), *Monitoring and Assessment of Structures*, Spon, London, 2001.
6. J. Prasad and C. G. K. Nair, *Non-destructive Test and Evaluation Materials*, McGraw-Hill, 2nd Edition, 2011.
7. Poonam I. Modi and Chirag N. Patel, *Repair and Rehabilitation of Concrete Structures,* Prentice-Hall of India Pvt. Ltd., New Delhi, 2016.

III B.Tech. – II Semester

(16BT6HS01) BANKING AND INSURANCE

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE REQUISITES: -

COURSE DESCRIPTION: Origin of Banking; Functions of Banking; Role & Functions of RBI; Bank-Customer Relationship; Deposit and Loan Services of Banks; Banking Procedures; Electronic Payment Mechanisms; Business Models; Concepts of Risk and Uncertainty; Fundamentals of Insurance; Principles of Insurance; Essentials of Insurance Contracts; Insurance players in India.

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

CO1. Demonstrate Knowledge in

a) Tools and concepts of Banking and Insurance.
b) Basic Principles and concepts of Insurance and Banking.
c) e-fund transfers, e-payments and e-business models.

CO2. Develop skills in providing solutions for
a) Online banking and e – payments.
b) Risk Management through insurance benefits the society at large.
c) Money management by leveraging on technology, banking and insurance services.

CO3. Exhibit conceptual soundness about banking and insurance, this would contribute to more employment opportunities.

CO4. Provide life skills for effective utilization of Banking and Insurance facilities.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO BANKING (09 Periods)

Origin and growth of banking, Meaning and functions of banking, Importance of banking, Reserve Bank of India; Functions, Monetary policy, Open market operations.

UNIT – II: BANK-CUSTOMER RELATIONSHIP (09 Periods)

Debtor-creditor relationship, anti money laundering, 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, types of loans.

UNIT – III: BUSINESS MODELS & ELECTRONIC PAYMENT SYSTEM (09 Periods)

Features, types of e-payment system, e-cash, NEFT, RTGS, Credit cards, Electronic purses and Debit cards. Business models- B2B, B2C, C2C, and B2G.

UNIT – IV: INTRODUCTION TO RISK AND INSURANCE (09 Periods)

Concept of risk, risk *Vs* uncertainty, Insurance definition, Insurance as risk mitigation mechanism, Elements of insurance.

UNIT – V: INSURANCE OVERVIEW (09 Periods)

Principles of insurance, insurance types, LIC & GIC insurance contract-nature, elements, functions, IRDA, Insurance Players in India.

Total Periods: 45

TEXT BOOKS:

1. A.V. Ranganadha Chary, R.R.Paul, *Banking and Financial system*, Kalyani Publisher, New Delhi, 2nd Edition.
2. P.K.Gupta, *Insurance and Risk Management*, Himalaya Publishing House, New Delhi.

REFERENCE BOOKS:

1. Diwan, Praq and Sunil Sharma, *Electronic Commerce- A Manager's Guide to E-Business*, Vanity Books International, Delhi, 2002.
2. Kalakota Ravi and Whinston Andrew B, *Frontiers of Electronic Commerce*, Pearson Education India, New Delhi, 1996.
3. Schneider, Grey P, *Electronic Commerce, Course Technology'*, Cengage Learning, 2008, 8th Edition, New Delhi.

III B. Tech. – II Semester

(16BT6HS02) BUSINESS COMMUNICATION AND CAREER SKILLS

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: Technical English or English at Diploma level

COURSE DESCRIPTION: Nature and Scope of Communication; Corporate Communication; Writing Business Documents; Careers and Resumes; Interviews.

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

CO1. Demonstrate knowledge in
- a) Corporate Communication
- b) Main Stages of Writing Messages
- c) Career Building

CO2. Analyze the possibilities and limitations of language in
- a) Communication Networks
- b) Crisis Management/Communication

CO3. Design and develop the functional skills for professional practice in
- a) Business Presentations & Speeches

CO4. Apply written and oral communication techniques in preparing and presenting various documents in technical writing.

CO5. Function effectively as an individual and as a member in diverse teams.

CO6. Communicate effectively with the engineering community and society in formal and informal situations.

DETAILED SYLLABUS:

UNIT–I: NATURE AND SCOPE OF COMMUNICATION (09 Periods)

Introduction: Functions of Communication – Roles of a Manager – Communication Basics –Communication Networks – Informal Communication – Interpersonal Communication –Communication Barriers

UNIT – II: CORPORATE COMMUNICATION (09 Periods)

Introduction: What is Corporate Communication? – Corporate Citizenship and Social Responsibility – Corporate Communication Strategy – Crisis Management /Communication – Cross-Cultural Communication.

UNIT – III: WRITING BUSINESS DOCUMENTS (09 Periods)

Introduction: Importance of Written Business Communication, Types of Business Messages – Five Main Stages of Writing Business Messages – Business Letter Writing – Effective Business Correspondence – Common Components of Business Letters – Strategies for Writing the Body of a Letter

UNIT – IV: CAREERS AND RESUMES (09 Periods)

Introduction – Career Building – Business Presentations and Speeches – Resume Formats – Traditional, Electronic and Video Resumes – Sending Resumes – Follow-up Letters – Online Recruitment Process

UNIT V – INTERVIEWS (09 Periods)

Introduction – Fundamental Principles of Interviewing – General Preparation for an Interview – Success in an Interview – Types of Interviewing Questions – Important Non-verbal Aspects – Types of Interviews – Styles of Interviewing

Total Periods: *45*

TEXT BOOKS:

1. Meenakshi Raman and Prakash Singh *Business Communication*, Oxford University Press, New Delhi, Second Edition, 2012.

REFERENCE BOOKS:

1. Neera Jain and Sharma Mukherji, *Effective Business Communication*, Tata McGraw-Hill Education, Pvt. Ltd., New Delhi, 2012.
2. Courtland L.Bovee et al., *Business Communication Today*, Pearson, New Delhi, 2011.
3. Krizan, *Effective Business Communication*, Cengage Learning, New Delhi, 2010.
4. R.K. Madhukar, *Business Communication*, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.

III B.Tech. – II Semester
(16BT6HS03) COST ACCOUNTING AND FINANCIAL MANAGEMENT

(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

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

PRE REQUISITES: -

COURSE DESCRIPTION: Scope, Objectives and Elements of Cost Accounting; Cost Sheet and Tender Quotations; Variance Analysis: Material variances, Labor variances; Meaning and Scope, Liquidity, Profitability Ratios: Concept of Risk and Return on Investment.

Course outcomes: On successful completion of this course, the students will be able to:

CO1. Acquire Knowledge in
- a) Elements of Costing.
- b) Basic concepts of Financial Management.
- c) Risk and Return
- d) Significance of Cost Accountancy
- e) Behavioral Finance

CO2. Develop skills in
- a) Material, Labor, Overheads control.
- b) Excellence and ability to minimize the cost of the organization

CO3. Develop effective Communication in Cost control and Financial Management.

CO4. Provide solutions for effective investment decisions.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO COST & COST ACCOUNTING **(09 Periods)**

Cost and Cost Accounting, Scope, Objectives, Advantages and disadvantages – Cost Accounting *Vs* Management Accounting – Elements of Costing – Installation of costing system – Material Control, Labour Control, Overhead Control.

UNIT - II: COST SHEET & PREPARATION OF COST SHEET **(09 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 (09 Periods)

Introduction to Standard Costing & Variances – Variance Analysis: Material variances, Labour variances (Simple Problems).

UNIT - IV: INTRODUCTION TO FINANCIAL MANAGEMENT & RATIO ANALYSIS (09 Periods)

Financial Management-Meaning and Scope, Liquidity, Profitability, Financial Statement Analysis through ratios (Simple Problems).

UNIT - V: INTRODUCTION TO INVESTMENT & BEHAVIORAL FINANCE (09 Periods)

Investment-Meaning and Definition- concept of risk and returns-Investment Alternatives- Introduction to Behavioral Finance – Anomalies –Key Concepts –Anchoring – Mental Anchoring-Confirmation and Hindsight Bias-Gambler's Fallacy-Herd Behavior-Over Confidence-Overreaction and Availability Bias-Prospect Theory.

Total Periods: *45*

TEXT BOOKS:

1. S.P. Jain and K.L. Narang, *Cost Accounting*, Kalyani Publishers, Ludhiana, 6th Edition, 2002.
2. James C Van Horne, *Financial Management and Policy*, Prentice-Hall of India/Pearson, 12th Edition, 2001.

REFERENCE BOOKS:

1. The Institute of Company Secretaries of India, *Cost and Management Study Material*, New Delhi.
2. I.M. Pandey, *Financial Management*, Vikas Publishing House Pvt. Ltd., 10th Edition, 2010.

III B.Tech. – II Semester

(16BT6HS04) ENTREPRENEURSHIP FOR MICRO, SMALL AND MEDIUM ENTERPRISES

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE REQUISITE: -

COURSE DESCRIPTION: Introduction to Entrepreneur Development; Idea generation and formation of Business Plan; Micro and Small Enterprises; Institutional Finance and Support to Entrepreneur; Woman Entrepreneurship.

Course outcomes: On successful completion of this course, the students will be able to:

CO1. Acquire Knowledge in
- a) Schemes and institutions encouraging entrepreneurship
- b) Basic Principles and concepts of Accountancy
- c) Significance of entrepreneurship

CO2. Develop skills in providing solutions for
- a) Personal excellence through financial and professional freedom
- b) Women entrepreneurship serving as contrivance in societal development

CO3. Develop Critical thinking and evaluation ability.

CO4. Widens knowledge and build up attitude towards trouble shooting.

CO5. Demonstrate business acumen.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION TO ENTREPRENEURSHIP DEVELOPMENT (09 Periods)

Concept of Entrepreneurship – Growth of Entrepreneurship in India - Factors affecting entrepreneurship growth - Characteristics of an Entrepreneur – Functions of Entrepreneur – Need for an Entrepreneur – Entrepreneurial Decision Process – 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 – Formulation of

Business Plan – Contents of Business Plan – Significance – Common Errors in Business Plan Formulation, The role of incubation centers for promoting Entrepreneurship, Start-up – New Guidelines.

UNIT – III: MICRO AND SMALL ENTERPRISES (09 Periods)

Meaning and Definition – Micro and Macro units – Essentials – Features – Characteristics – Scope of Micro and Small Enterprises – Objectives of Micro Enterprises – relationship between Micro and Macro Enterprises - Problems of Micro and Small 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 (SIDCs)– Small Industries Development Organisation (SIDO) – Small Industries Service Institutes (SISIs) – District Industries Centres (DICs) – National Institute of Entrepreneurship and Small Business Development (NIESBUD) – Technical Consultancy Organizations (TCOS). Micro Units Development and Refinance Agency Bank (MUDRA).

UNIT – V: WOMEN & RURAL ENTREPRENEURSHIP (09 Periods)

Concept of Women entrepreneur - Functions of Women entrepreneurs - Growth of women entrepreneurship in India - Challenges of Women entrepreneurs- Programmes 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.

Total Periods: 45

TEXT BOOKS:

1. Dr.S.S.Khanka*, Entrepreneurial Development*, S. Chand and Company Ltd, Revised Edition, 2012.
2. Madhurima Lall and Shikha Sahai, *Entrepreneurship*, Excel Books India, 2nd Edition 2008.

REFERENCE BOOKS:

1. Nandan, H., *Fundamentals of Entrepreneurship*, PHI Learning Pvt. Ltd., 2013, New Delhi, 3rd Edition 2013.
2. Vasanth Desai, *The Dynamics of Entrepreneurial Development and Management*, Himalaya Publishing House, 4th Edition 2009.
3. Bholanath Dutta, *Entrepreneurship Management – Text and Cases*, Excel Books, 1st Edition 2009.

III B.Tech. – II Semester

(16BT6HS05) FRENCH LANGUAGE (La Langue Francais)

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communications; Basic grmmar; Advanced grammar; Basic writing; Business French (La Francais Commercial).

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

CO1. Demonstrate knowledge in
- a) Process of communication
- b) Modes of listening
- c) Paralinguistic features
- d) Skimming and Scanning
- e) Elements of style in writing

CO2. Analyze the possibilities and limitations of language, understanding
- a) Barriers to Communication
- b) Barriers to Effective Listening
- c) Barriers to Speaking
- d) Formal and metaphorical language

CO3. Design and develop language skills for professional practice**.**

CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5. Understand French culture and civilization.

CO6. Communicate effectively with the native French in day to day situation

DETAILED SYLLABUS:

UNIT - I: ORAL COMMUNICATION (09 Periods)

Introduction - Language as a Tool of Communication, French alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT - II: BASIC GRAMMAR (09 Periods)

Introduction –Articles, -Er ending Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT - III: ADVANCED GRAMMAR (09 Periods)

Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice.

UNIT – IV: BASIC WRITING (09 Periods)

Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT - V: BUSINESS FRENCH (La Francais Commercial) (09 Periods)

Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.

Case study of influential French companies, Learning computer/ desktop/new age- media vocabulary, Introduction to how to present a topic, Fixing an Appointment

Total Periods: 45

TEXT BOOKS:

1. Annie Berther, *Alter Ego*, Hachette Publications, 2012.

REFERENCE BOOKS:

1 RegineMerieux, Yves Loiseau, *Connexions*, Goyall Publishers, 2011.
2. DelphineRipaud, *Saison*, French and Euroean Inc., 2015.

III B.Tech. – II Semester

(16BT6HS06) **GERMAN LANGUAGE**

(Deutsch alsFremdsprache)

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Oral communication; Basic grammar; Advanced grammar; Basic writing; Berufsdeutcsch (Business German)

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

CO1. Demonstrate knowledge in
- a) Process of communication
- b) Modes of listening
- c) Paralinguistic features
- d) Skimming and Scanning
- e) Elements of style in writing

CO2. Analyze the possibilities and limitations of language, understanding
- a) Barriers to Communication
- b) Barriers to Effective Listening
- c) Barriers to Speaking
- d) Formal and metaphorical language

CO3. Design and develop language skills for professional practice**.**

CO4. Apply basic writing skills in writing Emails and understanding wide range of technical terminologies.

CO5. UnderstandGerman culture and civilization.

CO6. Communicate effectively with the native German in day to day situation**.**

DETAILED SYLLABUS:

UNIT - I: ORAL COMMUNICATION (09 Periods)

Introduction - Language as a Tool of Communication, German alphabets, Phonetics and pronunciation, making contacts, giving information, Arranging things, Expression of feelings.

UNIT - II: BASIC GRAMMAR (09 Periods)

Introduction – Articles, Verbs, Nouns, Numbers, Gender, Pronouns, Sentence structure – Case study.

UNIT - III: **ADVANCED GRAMMAR (09 Periods)**

Introduction -Adjectives, Prepositions, Introduction to tenses – Present tense, past tense and future tense, Active and Passive voice, Introduction to Case- Akkusativ, Nominativ, Dativ&Genetiv Case.

UNIT - IV: **BASIC WRITING (09 Periods)**

Introduction -Introduction to written communication, Pre-writing, Creating context for writing and Data collection, fill in forms, Write greeting cards, Invitations and Short personal announcements, Short text to describe photos and pictures.

UNIT - V: **BERUFSDEUTCSCH (BUSINESS GERMAN)**
(09 Periods)

Introduction - E-mail writing, Letter writing, Learning technical vocabulary and its application.

Case studies of influential German companies, Learning computer/desktop/new age- media vocabulary, Introduction to how to present a topic, Fixing an Appointment.

Total Periods: 45

TEXT BOOKS:

1. Heuber, *Tangram Aktuelleins*, HeuberVerlagPublications, 2011.

REFERENCE BOOKS:

1. Anta Kursisa, Gerhard Newner, Sara vicenta, *Fir fuer Deutsch 1 und Deutsch 2,* HeuberVerlag Publications, 2005.
2. Herman Funk, *Studio D A1*, Cornelsen GOYAL SAAB Publication, 2011.

III B.Tech. – II Semester

(16BT6HS07) INDIAN CONSTITUTION

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Elements, functions and functionaries according to Indian Constitution, Understanding for better professional practice and good citizenry.

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

CO1. Gain knowledge in
- a) parliamentary proceedings, laws, legislature, administration and its philosophy
- b) federal system and judiciary of India
- c) socials problems and public services like central civil services and state civil services
- d) Indian and international political aspects and dynamics

CO2. Develop etiquette and professional behavior in line with the constitution of India for becoming a responsible citizen.

DETAILED SYLLABUS:

UNIT - I: PREAMBLE AND ITS PHILOSOPHY (08 Periods)

Introduction and Evolution of Indian Constitution, preamble and its Philosophy.

UNIT - II: UNION GOVERNMENT (08 Periods)

Powers, Functions and Position of President, Vice-President and Council of Ministers, Composition of parliament, Constitution Amendment Procedure, Financial Legislation in Parliament.

UNIT - III: FEDERAL SYSTEM (14 Periods)

Centre-State relations, Directive Principles of State Policy, Fundamental Rights and Duties, Centre-State Relations, Features of Federal System, Administrative Relationship between Union

and States, Powers, Functions and Position of Governors, Function of Chief Ministers, Council of Ministers, Composition and powers of the State Legislature.

UNIT - IV: JUDICIARY AND PUBLIC SERVICES (10 Periods)
The Union Judiciary - Supreme Court and High Court, All India Services, Central Civil Services, State Services, Local Services and Training of Civil Services.

UNIT - V: INTERNATIONAL POLITICS (05 Periods)
Foreign Policy of India, International Institutions like UNO, WTO, SAARC and Environmentalism.

Total Periods: 45

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. – II Semester

(16BT6HS08) INDIAN ECONOMY

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Time Value of Money; Elementary Economic Analysis; Value analysis, Value Engineering; Economic Planning.

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

CO1. Acquire the knowledge in
- a) Micro and Macro Economics.
- b) Traditional and Modern methods of Capital Budgeting.
- c) Five year plans and NITI Aayog.

CO2. Analyze
- a) Capital Budgeting.
- b) Value Analysis and Value Engineering.
- c) Economic analysis
- d) Law of supply and demand

CO3. Understand the nuances of project management and finance.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION (09 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: 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 – III: ELEMENTARY ECONOMIC ANALYSIS (09 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 - IV: VALUE ENGINEERING (06 Periods)

Introduction- Value Analysis, Value Engineering, Functions, Aims; Value Analysis vs. Value Engineering; Value Engineering Procedure- Advantages, Application Areas.

UNIT - V: ECONOMIC PLANNING (09 Periods)

Introduction - Need For Planningin 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.

Total Periods: 45

TEXT BOOKS:

1. Panneerselvam R., *Engineering Economics*, PHI Learning Private Limited, Delhi, 2/e, 2013.
2. Jain T.R., V. K.Ohri, O. P. Khanna, *Economics for Engineers,* VK Publication, 1/e, 2015.

REFERENCE BOOKS:

1. Dutt Ruddar and Sundhram K. P. M., *Indian Economy*, S. Chand, New Delhi, 62nd Revised Edition, 2010.
2. Misra, S.K. and V. K. Puri, *Indian Economy*: *Its Development Experience*, Himalaya Publishing House, Mumbai 32/e, 2010.

III B.Tech. - II Semester

(16BT6HS09) INDIAN HERITAGE AND CULTURE

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	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: On successful completion of this course, the students will be able to

CO1. Acquaint knowledge in
- a) human aspirations and values in Vedic culture.
- b) cultural aspects of Buddhism and Jainism
- c) unification of our country under Mourya's and Gupta's administrations
- d) socio Religious aspects of Indian culture
- e) reform movements and harmonious relations.

CO2. Apply ethical principles and reforms as models for the upliftment of the societal status in the present cultural contexts.

DETAILED SYLLABUS:

UNIT – I: BASIC TRAITS OF INDIAN CULTURE (09 Periods)

Meaning and definition and various interpretations of culture, Culture and its features, The Vedic and Upanishadic culture and society, Human aspirations and values in these societies, Chaturvidha purushardhas, Chaturashrma and Chaturvarna theory.

UNIT - II: HUMANISTIC REFORMS UNDER JAINISM AND BUDDHISM (09 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 (09 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 (09 Periods)

Western impact on India, Introductin 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 (09 Periods)

Vivekananda, Eswarchandra vidyasagar 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

TEXT BOOKS:

1. Valluru Prabhakaraiah, *Indian Heritage and Culture*, Neelkamal Publications Pvt. Ltd. Delhi, 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. L. P. Sharma, *History of Modern India*, Konark Publishers, Pvt. Ltd. New Delhi, 2010.
4. The Cultural Heritage of India Vol-I, II, III, IV, V, The Ramakrishna Mission Institute of Culture, Calcutta.

III B.Tech. – II Semester

(16BT6HS10) INDIAN HISTORY

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Ancient India; Classical and Medieval era; Modern India; India after independence.

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

CO1. Gain knowledge on evolution and history of India as a nation.

CO2. Analyze social and political situations of past and current periods.

CO3. Practice in career or at other social institutions morally and ethically.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION (08 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 (09 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 (06 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, ChangingNature of work and organization.

Total Periods: 45

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. Thapar, Romila, *Early India*, Penguin, 2002.

III B.Tech. – II Semester

(16BT6HS11) PERSONALITY DEVELOPMENT

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: Soft Skills Lab

COURSE DESCRIPTION: Self-esteem & Self-improvement; Developing Positive Attitudes; Self-Motivation & Self-Management; Getting Along with the Supervisor; Workplace Success.

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

CO1. Demonstrate knowledge in
  a) Self-Management
  b) Planning Career

CO2. Analyze the situations based on
  a) Attitudes
  b) Thinking strategies

CO3. Design and develop the functional skills for professional practice in

CO4. Function effectively as an individual and as a member in diverse teams.

CO5. Communicate effectively in public speaking in formal and informal situations.

DETAILED SYLLABUS:

UNIT – I: SELF-ESTEEM & SELF-IMPROVEMENT (09 Periods)

Know Yourself – Accept Yourself; Self-Improvement: Plan to Improve - Actively Working to Improve Yourself.

Case study: 1

UNIT – II: DEVELOPING POSITIVE ATTITUDES (09 Periods)

How Attitudes Develop – Attitudes are Catching – Improve Your Attitudes.

Case study: 2

UNIT – III: SELF-MOTIVATION & SELF-MANAGEMENT (09 Periods)

Show Initiative – Be Responsible Self-Management; Efficient Work Habits – Stress Management – Employers Want People Who can Think – Thinking Strategies.

Case study: 3

UNIT – IV: GETTING ALONG WITH THE SUPERVISOR (09 Periods)

Know your Supervisor – Communicating with Your Supervisor – Special Communications With Your Supervisor – What Should You Expect of Your Supervisor? – What Your Supervisor Expects of You - Moving Ahead Getting Along with Your Supervisor.

Case study: 4

UNIT - V: WORKPLACE SUCCESS (09 Periods)

First Day on the Job – Keeping Your Job – Planning Your Career – Moving ahead.

Case study: 5

Total Periods: 45

TEXT BOOK:

1. Harold R. Wallace and L. Ann Masters, *Personality Development*, Cengage Learning, Delhi, Sixth Indian Reprint 2011.

REFERENCE BOOKS:

1. Barun K. Mitra, *Personality Development and Soft Skills,* Oxford University Press, New Delhi, 2011.
2. Stephen R. Covey, *The 7 Habits of Highly Effective People*, Free Press, New York, 1989
3. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, Second Revised Edition 2011.
4. Stephen P. Robbins and Timothy A. Judge*, Organizational Behaviour*, Prentice Hall, Delhi, 16th Edition 2014.

III B.Tech. – II Semester

(16BT6HS12) PHILOSOPHY OF EDUCATION

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to Philosophy and Engineering Education; Philosophical methods and their implications in engineering; Philosophical education in India; Values and Engineering education; Outcome based education.

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

CO1. Acquire knowledge in
- a) Philosophy of engineering education.
- b) Philosophical methods.
- c) Knowledge acquiring methods.
- d) Engineering education and responsibilities.

CO2. Understand the impact of Outcome Based Education for effective educational Outcomes.

CO3. Apply reasoning to assess societal issues with the contextual knowledge of engineering education and responsibilities.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO PHILOSOPHY AND ENGINNERING EDUCATION (09 Periods)

Concept, Significance, and Scope of Philosophy in Engineering – Aims of Engineering Education – Relationship between philosophy and engineering education – Speculative, normative and critical approaches of philosophy in engineering.

UNIT - II: PHILOSOPHICAL METHODS AND THEIR IMPLICATIONS IN ENGINEERING (09 Periods)

Introduction to Philosophical approaches: Idealism, Naturalism, Pragmatism, Realism and Existentialism; Significance and Scope in Engineering Education.

UNIT - III: PHILOSOPHICAL EDUCATION IN INDIA (09 Periods)

Different branches of philosophy- meaning, Epistemology: nature and scope; Knowledge acquiring methods; Kinds and instruments of knowledge; Re-shaping of educational thoughts by Indian thinkers:

Rabindranath Tagore, Sri Aurobindo Gosh, Mahatma Gandhi, Jiddu Krishnamurthy and Swamy Vivekananda.

UNIT - IV: VALUES AND ENGINEERING EDUCATION (09 Periods)

Introduction; Engineering educationand responsibilities: health, social, moral, ethics aesthetic; Value: crisis and strategies forinculcation;
Case study: Engineering Solutions given by Mokshagundam Visvesvaraya

UNIT - V: OUTCOME-BASED EDUCATION (09 Periods)

Institutional visioning; Educational objectives; Programme outcomes, Curriculum, Stakeholders, Infrastructure and learning resources; Governance and management, Quality in education.

Total Periods: 45

TEXT BOOKS:

1. Ganta Ramesh, *Philosophical Foundations of Education*, Neelkamal Publications, 1/e, 2013
2. CarlMicham, *Thinking Through Technology (The Paths between Engineering and Philosophy)*, University of Chicago Press, 1/e, 1994.
3. Louis L Bucciarelli, *EngineeringPhilosophy,* Delft University Press, 1/e, 2003.
4. NBA/ABET Manuals.

REFERENCE BOOKS:

1. Louis L Bucciarelli, *Philosophy of Technology and Engineering Sciences*, North Holland, 1/e, 2009 (e-book).
2. Samuel Florman, *Existential pleasures of education*. Martins's Griffin S.T. publication, 1/e, 1992.

III B.Tech. – II Semester

(16BT6HS13) PUBLIC ADMINISTRATION

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction; Public Policy; Good Governance; E-Governance; Development Administration.

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

CO1. Acquire knowledge in
- a) Public Policy.
- b) Good Governance.
- c) E-governance.
- d) Development Administration.

CO2. Analyze the possibilities and limitations ofexisting policies through Good Governance perspective.

CO3. Design and develop solutions in e-governance modelsto find and provide opportunities in e-governance.

CO4. Adopt principles of e-governance in addressing the existing issues and challenges in e-governance sector.

CO5. Understand the significance of Administrative Development in finding professional engineering solutions by probing

a) Bureaucracy.

b) Role of civil society.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION (09 Periods)

Public and Private Administration- Differences and Similarities, Meaning, Scope; Importance of Public Administration in Modern Era; Public Administration and its implications in the field of Engineering.

Case Study: Unique Identification Authority of India (UIDAI): Aadhaar Project: Challenges Ahead

UNIT – II: PUBLIC POLICY (09 Periods)

Meaning and Scope; Policy Formulation in India; Policy making process; Policy Implementation **E**ngineering and Public Policy,Social, ethical,

Monetary and fiscal policies; policy implications of engineering;The engineer's role in Public Policy.
Case Study: NITI Aayog: Demonetization and Aftermath of Demonetization – Cashless transactions.

UNIT – III: GOOD GOVERNANCE (09 Periods)
Significance; Objectives;Concepts;Reforms;Organization and its basic problemsAdministrative and Governance reforms in India; Sustainable and Inclusive growth in India;Engineering and Sustainable Environment-Role of Engineers; Right to information Act
Case Study: Strategies in Good Governance: A Case Study of Karnataka, Kerala and Orissa.

UNIT – IV: E-GOVERNANCE (09 Periods)
Meaning, Significance, Issues in E-governance; E-governance Models, Problems and Opportunities; Application of DataWarehousing and Data Mining in Governance; Engineers role in re-engineering E-governance.
Case Study: e-Housing System for Bhavana Nirman Dhanasahayam Online disbursement of housing assistance in Kerala.

UNIT - V: DEVELOPMENT ADMINISTRATION (09 Periods)
Introduction; Development Administration-Administrative Development-Sustainable Development -Significance- Objectives; Bureaucracy - Personnel administration and human resources development; Role of civil society-Citizens and administration;Development and Engineering: Issues Challenges and Opportunities.

Case Study: Neeru-Chettu (Water-Tree) of Andhra Pradesh.
Case Study: TPDDL of Delhi and Odisha.

Total Periods: 45

TEXT BOOKS:

1. M.P. Sharma, B.L. Sadana, HarpreetKaur. *Public Administration in Theory and Practice.*KitabMahal, Mumbai, 1/e, 2014.
2. CSR Prabhu, *E. Governance – concepts and case studies*.PHI, New Delhi, 2/e 2012.

REFERENCE BOOKS:

1. SurendraMunshi, Bijupaul Abraham*Good Governance, Democratic societies and Globalization*, Sage publications, New Delhi, 1/e, 2004.
2. R.K.Sapru, *Public Policy,* Sterling Publishers Pvt Ltd., New Delhi, 1/e, 2001.

III B.Tech. – II Semester

(16BT60112) BUILDING MAINTENANCE AND REPAIR

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Durability of buildings, Failure and repair of buildings, MaterialTechniques for repair, Maintenance of buildings, Conservation and recycling.

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

CO1. Acquire basic knowledge on durability and serviceability, failures, repair and rehabilitation of buildings.
CO2. Analyze failures, repair and rehabilitation techniques.
CO3. Solve complex building maintenance problems through proper investigations and interpretation.
CO4. Use modern tools and techniques for various repairs and rehabilitation of structures.
CO5. Provide solutions for building maintenance and repair problems considering health and safety.
CO6. Consider environmental sustainability in building maintenance and repair.
CO7. Maintain ethical standards for quality in repairs and rehabilitation of structures.
CO8. Evaluate specifications and perform cost analysis of building components while repair and rehabilitation.

DETAILED SYLLABUS:

UNIT – I: DURABILITY AND SERVICEABILITY OF BUILDINGS (10 Periods)

Life expectancy of different types of buildings; Effect of environmental elements such as heat, dampness, frost and precipitation on buildings; Effect of chemical agents on building materials, Effect of pollution on buildings, Effect of fire on building; Damage by biological agents like plants, trees, algae, fungus, moss, insects, etc.; Preventive measures on various aspects, Inspection, Assessment procedure for evaluating for damaged structures, Causes of deterioration, Testing techniques.

UNIT – II*:* FAILURE AND REPAIR OF BUILDINGS (10 Periods)

Building failure – Types, Methodology for investigation; Diagnostic testing methods and equipment, Repair of cracks in concrete and masonry, Materials for Repair, Methods of repair, Repair and strengthening of concrete buildings, Foundation repair and strengthening, Underpinning, Leakage of roofs and repair methods.

UNIT – III: TECHNIQUES FOR REPAIR (08 Periods)

Rust eliminators and polymers coating for rebars during repair, Foamed concrete, Mortar and dry pack, Vacuum concrete, Gunite and shotcrete, Epoxy injection, Mortar repairs for cracks, Shoring and underpinning.

UNIT – IV: MAINTENANCE OF BUILDINGS (09 Periods)

Reliability principles and its applications in selection of systems for building, Routine maintenance of building, Maintenance cost, Specifications for maintenance works, Dampness - Damp proof courses, Construction details for prevention of dampness; Termite proofing, Fire protection, Corrosion protection.

UNIT – V: CONSERVATION AND RECYCLING (08 Periods)

Performance of construction materials and components in service, Rehabilitation of constructed facilities, Conservation movement, Materials and methods for conservation work, Recycling of old buildings and its advantages, Examples.

Total Periods: *45*

TEXT BOOKS:

1. Dennison Campbell, Allen and Harold Roper, *Concrete Structures – Materials, Maintenance and Repair*, Longman Scientific and Technical, UK, 1991.
2. Allen, R. T. L., Edwards, S. C. and J. D. N. Shaw, *The Repair of Concrete Structures*, Blackie Academic & Professional, UK, 1993.

REFERENCE BOOKS:

1. Peter H. Emmons, *Concrete Repair and Maintenance*, John Wiley and Sons Publications, 2002.
2. Building Construction under Seismic Conditions in the Balkan Region, UNDP/UNIDO Project Rer/79/015, Volume 5, *Repair and Strengthening of Reinforced concrete, Stone and Brick Masonry Buildings*, United Nations Industrial Development Organisation, Vienna.
3. Shetty, M. S., *Concrete Technology*, S. Chand and Company.
4. Smith, P. and Julian, W., *Building Services*, Applied Science Publications, London, 1976.
5. SP: 25, BIS; *Causes and Prevention of Cracks in Buildings*.
6. Champion, S., *Failure and Repair of Concrete Structures*, John Wiley and Sons Publications, 1961.
7. Perkins, P. H., Repair, Protection and Water Proofing of Concrete Structures, E& FN Spon, UK, 3rd Edition, 1997.

III B.Tech. – II Semester
(16BT60113) CONTRACT LAWS AND REGULATIONS

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	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. Demonstrate basic Knowledge on construction contracts, tenders, arbitration, legal requirements and labour regulations.
CO2. Analyze contracts and tenders.
CO3. Address the legal issues in contracts and tenders.
CO4. Follow laws and regulations in the preparation of contracts and tenders.
CO5. Prepare contract and tender documents as per the standards.
CO6. Consider project schedule, cost, quality and risk in the preparation of contracts and tenders.

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.

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

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 Nexis Butterworths 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.

III B.Tech. - II Semester

(16BT60114) DISASTER MITIGATION AND MANAGEMENT

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES:

COURSE DESCRIPTION: Disasters; Earthquakes; Floods; Cyclones; Droughts; Landslides; Disaster management.

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

CO1. Demonstrate knowledge on disasters, their vulnerability and mitigation measures.
CO2. Analyze disasters and their vulnerability.
CO3. Design strategies for effective disaster mitigation.
CO4. Address pre and post disaster issues for better preparedness and mitigation measures, through proper analysis and interpretation.
CO5. Use appropriate methods in disaster mitigation and management.
CO6. Use historical data of disasters to inform the people over preparedness and mitigation measures.
CO7. Solve disaster related issues considering environment.
CO8. Consider economical issues in disaster management.

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 activity in India, Seismic zones of India, Earthquakes in A.P., Action plan for earthquake disaster preparedness, Elements at risk, Recovery and rehabilitation after earthquake, Earthquake resistant design and construction of buildings; Tsunami – Onset, Types and causes, Warning,

Elements at risk, Typical effects, Specific preparedness and mitigation strategies.

UNIT - III: FLOODS, CYCLONES AND DROUGHTS (11 Periods)

Floods and Cyclones: Onset, Types, Warnings; Elements at risk, Typical effects, Indian floods and cyclones, Hazard zones, Potential for reducing hazards, Mitigation strategies and community based mitigation.

Droughts: Onset, Types and warning; Causes, Impact, Early warning and response mechanisms, Mitigation strategies, Droughts in India.

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.

UNIT - V: DISASTER MANAGEMENT (08 Periods)

Disaster management organization and methodology, Disaster management cycle, Disaster management in India – Typical cases; Cost–benefit analysis with respect to various disaster management programs implemented by NGOs and Government of India.

Total Periods: 45

TEXT BOOKS:

1. V. K. Sharma, *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 Hazards and 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. R. B. Singh, *Natural Hazards and Disaster Management*, Rawat Publications, 2009.

III B.Tech - II Semester
(16BT60115) ENVIRONMENTAL POLLUTION AND CONTROL

(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

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

CO1. Demonstrate knowledge on air, water, soil pollution and their control and solid waste management.
CO2. Analyze causes and effects of air, water and soil pollution and their remedial measures.
CO3. Recommend suitable solutions to complex environmental pollution problems.
CO4. Use appropriate remedial technique to solve environmental pollution problems.
CO5. Understand the effects of environmental pollutionon human health and vegetation.
CO6. Encourage sustainable development through implementation of pollution control measures.
CO7. Maintain IS Codes for environmental quality control.

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.

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.

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 and disposal – Primary, Secondary, Tertiary; Case studies.

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, Case studies.

UNIT – V: MUNICIPAL SOLID WASTE MANAGEMENT (09 Periods)

Types of solid waste, Composition of solid waste, Collection and transportation of solid waste, Methods of disposal – Open dumping, Sanitary landfill, Composting, Incineration, Utilization - Recovery and recycling, Energy Recovery.

Total Periods: 45

TEXT BOOKS:

1. Peavy, H. S, Rowe, D. R., and Tchobanoglous, G., *Environmental Engineering*, McGraw-Hill Inc., 1985.
2. C. S. Rao, *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. M. N. Rao and H. V. N. Rao, *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. S. M. Khopkar, *Environmental Pollution Monitoring and Control,* New Age International Pvt. Ltd., 2nd Edition, 2007.
4. V. M. Domkundwar, Environmental Engineering, Dhanpat Rai & Co. Pvt. Ltd., New Delhi, 2014.

III B.Tech - II Semester
(16BT60116) PLANNING FOR SUSTAINABLE DEVELOPMENT

(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES:-

COURSE DESCRIPTION: Sustainable development; Environmental impact; Sustainable Policies; Governance; Theories and strategies; Media and education for sustainability.

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

CO1. Demonstrate the knowledge on sustainable development, environmental impact, sustainable policies, governance, systems and strategies, media and education for sustainability.
CO2. Analyze theories, environmental impact, policies, systems and strategies for sustainable development.
CO3. Develop suitable methods and systems for sustainable development.
CO4. Use appropriate techniques in solving issues related to sustainable development.
CO5. Provide solutions to problems associated with sustainable development considering society.
CO6. Consider environment while planning sustainable development.
CO7. Communicate effectively on sustainable development issues through media and education.
CO8. Consider economical issues while planning for sustainable development.

DETAILED SYLLABUS:

UNIT – I: SUSTAINABLE DEVELOPMENT (09 Periods)

Definition and concepts of sustainable development, Capitalization of sustainability - National and global context; Millennium development goals, Emergence and evolution of sustainability and sustainable development, Theories of sustainability, Case studies.

UNIT – II: ENVIRONMENTAL IMPACT (09 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 (09 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 (09 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 (09 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

TEXT BOOKS:

1. John Blewitt, *Understanding Sustainable Development*, Earth Scan Publications Ltd., 2nd Edition, 2008.
2. Jennifer A. Elliot, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 4th Edition, 2006.

REFERENCE BOOKS::

1. Peter Rogers, Kazi F Jalal and John A Boyd, *An Introduction to Sustainable Development*, Earth Scan Publications Ltd., 2006.
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.

III B.Tech. – II Semester
(16BT60117) PROFESSIONAL ETHICS
(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Engineering ethics; Professional ideals and virtues; Engineering as social experimentation; Responsibilities and rights; Global issues.

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

CO1. Demonstrate the principles of ethics, importance of professional values and social responsibility.
CO2. Analyze the problems in the implementation of moral autonomy and use ethical theories in resolving moral dilemmas.
CO3. Develop suitable strategies to resolve problems arise in practicing professional ethics.
CO4. Provide solutions to complex problems associated with professional ethics by proper analysis and interpretation.
CO5. Use appropriate theories in resolving issues pertain to professional ethics.
CO6. Understand the impact of professional ethics on society and address the limitations of codes of ethics.
CO7. Practice engineering with professionalism, accountability and ethics.
CO8. Function as a member, consultant, manager, advisor and leader in multi-disciplinary teams.
CO9. Write reports without bias and give instructions to follow ethics.

DETAILED SYLLABUS:

UNIT - I: ENGINEERING ETHICS (09 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 (08 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 (10 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: RESPONSIBILITIES AND RIGHTS (09 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 ISSUES (09 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: 45

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.
3. Charles F. Fledderman, *Engineering Ethics*, Pearson Education, 2nd Edition, 2004.
4. R. Subramanaian, *Professional Ethics*, Oxford Higher Education, 2013.

III B.Tech. - II Semester
(16BT60118) RURAL TECHNOLOGY
(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

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

PREREQUISITES: -

COURSE DESCRIPTION: Rural technology; Non conventional energy; Technologies for rural development; Community development; IT in rural development.

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

CO1. Demonstrate the knowledge on technologies for rural development.
CO2. Analyze various technologies available which are appropriate for rural development.
CO3. Carryout feasibility study on the public and private partnership for rural development.
CO4. Develop and use latest technologies for rural development.
CO5. Address health and safety issues while choosing technologies for rural development.
CO6. Educate the rural populace on the positive impacts of biofertilisers and usage of agromachinery in agriculture.

DETAILED SYLLABUS

UNIT – I: RURAL TECHNOLOGY (09 Periods)

India - Technology and rural development, Pre and post independence period, Rural India 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 (09 Periods)

Definition of energy, Types of alternative sources of energy, Sources of non conventional energy – Solar energy: 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 (09 Periods)

Food and agro based technologies, Tissue culture, Nursery, Building and construction technologies, Cultivation and processing of economic plants, Cottage and social industries.

UNIT – IV: COMMUNITY DEVELOPMENT (09 Periods)

Water conservation, Rain water Harvesting, Drinking water, Environment and Sanitation, Bio fertilizers, Medical and aromatic plants, Employment generating technologies – Apiculture, Pisciculture, Aquaculture.

UNIT – V: IT IN RURAL DEVELOPMENT (09 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 Saansad Adarsh Gram Yojana (SAGY), Village adoption schemes.

TEXT BOOKS:

1. M. S. Virdi, *Sustainable Rural Technologies*, Daya Publishing House, 2009.
2. S. V. Prabhath and P. Ch. Sita Devi, *Technology and Rural India*, Serials Publications, 2012.

REFERENCE BOOKS:

1. R. Chakravarthy and P. R. S. Murthy, *Information Technology and Rural Development,* Pacific Book International, 2012.
2. Shivakanth Singh, *Rural Development Policies and Programmes,* Northern Book Centre, 2002.
3. L. M. Prasad, *Principles and Practice of Management*, S. Chand & Sons, 8th Edition, 2014.
4. Venkata Reddy, K., *Agriculture and Rural Development - Gandhian Perspective*, Himalaya Publishing House, 2001.

III B.Tech - II Semester
(16BT60308) GLOBAL STRATEGY AND TECHNOLOGY

(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	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: On successful completion of this course, the students will be able to:

CO1. Demonstrate the knowledge on Strategic management, Research & Development strategies, Technology management and transfer, Globalization and Corporate governance.
CO2. Indentify and analyze crucial problems in strategic management to improve performance of the organizations.
CO3. Develop the products and production process by using research and development strategies.
CO4. Conduct investigations on the impact of globalization in current scenario in the context of corporate governance.
CO5. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable development.
CO6. Apply ethics in strategic decision making.

DETAILED SYLLABUS

UNIT - I: STRATEGIC MANAGEMENT (09 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.

UNIT - II: RESEARCH & DEVELOPMENT STRATEGIES (09 Periods)

Concept, Evolution of R&D Management, R&D as a business, R&D as competitive advantage, Elements of R & D strategies, Integration of R & D, Selection and implementation of R & D strategies, R & D trends.

UNIT - III: TECHNOLOGY MANAGEMENT AND TRANSFER (09 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 - IV: GLOBALISATION (09 Periods)

Definition, Stages, Essential conditions for globalization, Globalization strategies, Competitive advantage of Nations, Factors affecting Globalization, Globalization of Indian business.

UNIT – V: CORPORATE GOVERNANCE: THE INDIAN SCENARIO (09 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

TEXT BOOKS:

1. Francis Cherunilam, *Strategic Management*, Himalaya Publishing House, 3rd Edition, 2002.
2. C.S.G.Krishnamacharyulu and Lalitha Ramakrishnan, *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, 1st Edition, 2007.
2. S.K.Mandak, *Ethics in Business and Corporate Governance*, TMH, 2nd Edition, 2012.

III B.Tech - II Semester

(16BT60309) INTELLECTUAL PROPERTY RIGHTS AND MANAGEMENT

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION:

Protection of ideas; innovation and artistic endeavors; Acts and procedure related to patents, trademarks, copy right, design registration, trade secrets and cyber laws; Infringement; Commercialization of intellectual property rights; Case studies in each.

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

CO1. Demonstrate knowledge on intellectual property rights, patents, trademarks, copyrights, trade secrets and commercialization of intellectual property.

CO2. Analyse the commercial significance of discoveries and developments and to assist in bringing these into public use.

CO3. Investigate and ensure smooth transition from concept to final product by following National & International Laws of Intellectual Property.

CO4. Utilize the various policies and procedures related to patents, trademarks and copyrights relating to IPR.

CO5. Safeguard, review and manage the intellectual property so that it may receive adequate and appropriate legal protection against unauthorized use.

CO6. Follow ethical standards in capacity building and work as a platform for development, promotion, protection, compliance, and enforcement of intellectual property and knowledge.

CO7. Prepare documents and fill applications needed for filing a patent, design, copyright and trade mark.

DETAILED SYLLABUS:

UNIT – I: OVERVIEW OF INTELLECTUAL PROPERTY RIGHTS (09 Periods)

Introduction, Intellectual Property vs Conventional Property, and importance of intellectual property rights (IPRs), types of intellectual property, International Treaties for protection of IPR-Paris Convention, World Intellectual Property Organization (WIPO), World Trade Organization (WTO), Trade Related Aspects of Intellectual Property Rights (TRIP) Agreement, General Agreement on Tariffs and Trade(GATT).

UNIT – II: TRADEMARKS **(09 Periods)**

Introduction, Functions and kinds of trademarks, Trade Mark Registration Process, Post registration procedures, Trade Mark maintenance, Transfer of rights, Inter Mark claims, International Trade Mark Law.

UNIT – III: PATENTS **(09 Periods)**

Introduction, Rights under Patent Law, Patent Application Process, Terms and Maintenance of Patents Requirements, Patent Ownership and Transfer, Licensing of Patent Rights, Sole and Joint Inventors, Disputes over Inventorship, Patent Infringement, International Patent Law, Patent Cooperation Treaty (PCT), Patent Law Treaty (PLT), Substantive Patent Law Treaty (SPLT).

UNIT - IV: COPY RIGHTS, TRADE SECRETS, CYBER LAWS

(09 Periods)

Copy Rights: Introduction, nature and scope, subject matter, Rights afforded by copyright law, Copyrights ownership, transfers and duration, Copyright registration process.

Trade Secrets: Introduction, Determination of Trade Secret Status, Emploer-Employee Relationships, Protection of submissions.

Cyber laws: E-commerce and cyber laws, cyber crime and legislation- need, objective and scope; IT Act 2000, Information Technology and Information Security.

UNIT - V: INDUSTRIAL DESIGN AND COMMERCIALIZATION OF INTELLECTUAL PROPERTY RIGHTS **(09 Periods)**

Industrial Design: Intoduction, Indian Law related to registration of Industrial Designs, Essential requirements for registration of a design in India, International Agreements – Hague System; Conflicts related to registration of design.

Commercialization of Intellectual Property Rights: Competition and Confidentiality Issues, Antitrust Laws, Assignment of Intellectual Property Rights, Technology, Transfer Agreements, Intellectual Property Issues in the Sale of Business, Legal Auditing of Intellectual Property, Due Diligence of Intellectual Property Rights in a Corporate Transaction.

Total Periods: 45

TEXT BOOKS:

1. Deborah E. Bouchoux, *Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets*, Cengage Learning, 4th Edition, 2016.
2. Kompal Bansal and Parikshit Bansal, *Fundamentals of Intellectual Property for Engineers*, BS Publications, 1st Edition, 2013.

REFERENCE BOOKS:

1. Prabuddha Ganguli, *Intellectual Property Rights-Unleashing the Knowledge Economy*, McGraw-Hill Education, 6th Reprint, 2015.
2. P. Narayanan, *Intellectual Property Law*, Eastern Book Company, 3rd Edition, 2013.
3. R. Radha Krishnan, S. Balasubramanian, *Intellectual Property Rights: Text and Cases*, Excel Books, 1st Edition, 2008.

III B.Tech – II Semester
(16BT60310) MANAGING INNOVATION AND ENTREPRENEURSHIP

(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Evolution of entrepreneurship from economic theory Managerial and entrepreneurial competencies; Concepts of Shifting Composition of the Economy Purposeful Innovation & Sources of Innovative Opportunity; The Innovation Process; Innovative Strategies; Entrepreneurial Motivation; Entrepreneurs versus inventors; Ethics and International Entrepreneurship; Strategic Issues in International Entrepreneurship; Problem solving Innovation and Diversification.

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

CO1: Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures.
CO2: Analyze business plans for potential investors and stakeholders and effectively answer probabilistic questions on the substance of plan.
CO3: Develop a comprehensive and well planned business structure for a new venture.
CO4: Conduct investigation on complex problems, towards the development of Project.
CO5: Apply modern statistical and mathematical tools to design projects and subsequent work procedures.
CO6: Apply ethics in constructive innovation framework.
CO7: Exhibit professionalism by employing modern project management and financial tools.

DETAILED SYLLABUS:

UNIT - I: CREATIVITY AND INNOVATION (07 Periods)

Introduction, Levels of innovation, Purposeful innovation and the sources of innovative opportunity, The innovation process, Innovative strategies, Strategies that aim at introducing and innovation, Dynamics of ideation and creativity – Inbound, Outbound; Context and process of new product development, Theories of outsourcing.

UNIT - II: PARADIGMS OF INNOVATION (11 Periods)

Systems approach to innovation, Innovation in the context of developed economies and Emerging economies, Examining reverse innovation and its application, Performance gap, Infrastructure gap, Sustainability gap, Regulatory gap, Preference gap, organizational factors effecting innovation at firm level.

UNIT - III: SOURCES OF FINANCE AND VENTURE CAPITAL (07 Periods)

Importance of finance, Comparison of venture capital with conventional development capital, Strategies of venture funding, Investment phases, Investment process,

Advantages and disadvantages of venture capital, Venture capital developments in India.

UNIT - IV: INTELLECTUAL PROPERTY INNOVATION AND ENTREPRENEURSHIP (11 Periods)

Introduction to Entrepreneurship, Evolution of entrepreneurship from economic theory, Managerial and entrepreneurial competencies, Entrepreneurial growth and development, Concepts, Ethics and Nature of International Entrepreneurship, Intellectual property – forms of IP, Patents, Trademarks, Design registration, Copy rights, Geographical indications, Patent process in India.

UNIT - V: OPEN INNOVATION FRAMEWORK & PROBLEM SOLVING (09 Periods)

Concept of open innovation approach, Difference between open innovations and Cloud innovation approaches, Limitations and Opportunities of open innovation framework, Global context of strategic alliance, Role of strategic alliance, Problem Identification and Problem Solving, Innovation and Diversification.

Total Periods: 45

TEXT BOOKS:

1. Vinnie Jauhari, Sudhanshu Bhushan, *Innovation Management*, Oxford University Press, 1st Edition, 2014.
2. Drucker, P. F., *Innovation and Entrepreneurship*, Taylor & Francis, 2nd Edition, 2007.

REFERENCE BOOKS:

1. Robert D Hisrich, Claudine Kearney, *Managing Innovation and Entrepreneurship,* Sage Publications, 1st Edition, 2014.
2. V.K.Narayanan, *Managing Technology and Innovation for Competitive Advantage*, Pearson India, 1st Edition, 2002.

III B. Tech – II Semester

(16BT60311) MATERIALS SCIENCE

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Structure and Bonding in metals; Steels, Cast Irons and Non Ferrous alloys; Material Selection for conductors, Insulators and semi conductors; Strengthening mechanisms of metals; Plastics and Ceramics as Insulators; AC and DC properties of Insulators; Semiconductors and Magnetic materials; Composite materials in Electrical and Electronics engineering; Material Selection and manufacturing of Optical fibers.

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

CO1. Demonstrate the knowledge on concepts of fundamental science and Engineering principles relevant to materials.
CO2. Analyze the structures of various types of Ferrous, Non ferrous alloys influencing various engineering applications.
CO3. Conduct investigations to select suitable materials with desired properties for engineering applications.
CO4. Use phase diagrams to interpret the data regarding microstructure of materials.
CO5. Consider health and safety issues while providing materials to real time applications.
CO6. Use composite materials that reduce material waste in design and manufacturing for sustainability.

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO MATERIALS SCIENCE (07 Periods)

Structure of metals: Bonds in Solids, Crystallization of metals, Grain and grain boundaries, Effect of grain boundaries on the properties of metals / alloys, Determination of grain size measurement.

Constitution of alloys: Necessity of alloying, Types of solid solutions, Hume rothery rules, Intermediate alloy phases.

UNIT - II: CAST IRONS, STEELS & NON-FERROUS METALS

(12 Periods)

Structure and properties of Grey cast iron, Spheroidal cast iron, White Cast iron, Malleable Cast iron, Alloy cast irons, Classification of steels, structure and properties of plain carbon steels, Structure and properties of Copper and its alloys, Aluminum and its alloys.

UNIT - III: ELECTRIC CONDUCTORS & INSULATORS (12 Periods)

Type of materials selected for conductors, Insulators and semi conductors, Introduction to ceramics - Bonding and microstructure, DC properties of ceramic materials, AC properties of ceramic materials, mechanical properties, Ceramics as Conductors, Insulators and capacitors; Introduction to Plastics - DC properties, AC properties, Mechanical properties.

UNIT - IV: SEMICONDUCTORS AND MAGNETIC MATERIALS

(09 Periods)

Fabrication of Semiconductors, Producing a silicon wafer-Lithography and Deposition packaging of semiconductors materials; Types of magnetic materials, Measuring magnetic properties, Application of soft magnetic materials in Electromagnets and relays, AC transformers, Generators and motors.

UNIT - V: ADVANCED MATERIALS AND APPLICATIONS

(05 Periods)

Composites - Fiber reinforced metal matrix, Ceramic matrix, Polymer matrix, Properties and applications of composites; Ceramics - Alumina, Zirconia, Silicon Carbide, SiAlONs, Reaction Bonded Silicon Nitride (RBSN); Glasses- properties and applications, manufacturing of optical fibers.

Total Periods: 45

TEXT BOOKS:

1. Kodgire V D, *Material Science and Metallurgy*, Everest Publishing House, Pune, 31st Edition, 2011.
2. Ian. P.Jones, *Material Science for Electrical and Electronic Engineers*, Oxford University Press, 1st Edition, 2000

REFERENCE BOOKS:

1. V. Raghavan, *Physical Metallurgy: Principles and Practices*, PHI, New Delhi, 2nd Edition, 2006.
2. William. D. Callister, *Materials Science & Engineering-An Introduction*, John Wiley and Sons, New Delhi, 6th Edition, 2002.

III B.Tech - II Semester

(16BT70412) GREEN TECHNOLOGIES

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Principles of green engineering; Green communications; Green energy; Green computing; Green construction; Green manufacturing.

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

CO1. Deploy conceptual knowledge in green technologies pertaining to engineering practice.
CO2. Analyze various green technologies for engineering practice.
CO3. Provide green solutions to engineering problems.
CO4. Apply various green techniques in the engineering practice.
CO5. Consider health and safety issues while providing green solutions to the society.
CO6. Understand issues related to environment sustainability.
CO7. Apply ethical standards for environmental sustainability in the engineering practice.

DETAILED SYLLABUS:

UNIT - I: PRINCIPLES OF GREEN ENGINEERING AND GREEN COMMUNICATIONS (11 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 (09 Periods)

Introduction, adverse impacts of carbon emission, control of carbon emission– methods, greenhouse gas reduction – methods, Energy sources and their availability, Green energy for sustainable development. Green energy sources – Solar energy, Wind energy, Fuel cells, Biofuels, Wave and Geothermal energy (Principle of generation only).

UNIT - III: GREEN IT (09 Periods)

The importance of Green Information technologies, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance,

Communication and Social Media, Regulating Green IT- Laws, Standards and Protocols; RoHS, REACh, WEEE, Legislating for GHG Emissions and Energy Use of IT Equipment, Non-regulatory Government Initiatives, Industry Associations and Standard Bodies, Green Building Standards, Green Data Centres, Social Movements and Greenpeace, Conclusions.

UNIT - IV: GREEN CONSTRUCTION (09 Periods)

Green Building: Definition, Typical features, 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.

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 (09 Periods)

Introduction, background, definition, motivation and barriers to green manufacturing, Impact of manufacturing in environmental ecology, Need for green manufacturing, Advantages and Limitations, green manufacturing strategies, Green manufacturing and sustainability, Sustainability tools; Waste stream mapping and application, Green manufacturing through clean energy supply, green lean manufacturing, green packaging and supply chain.

Total Periods: 47

TEXT BOOKS:

1. Konstantinos Samdanis, Peter Rost, Andreas Maeder, Michela Meo, Christos Verikoukis*, Green Communications: Principles, Concepts and Practice, John Wiley & Sons, 2015.*
2. Soli J. Arceivala, *Green Technologies for a better future,* McGraw-Hill Education (India) Pvt Ltd, 2014.
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. *IGBC Green Homes Rating System Version 1.0* – A bridged reference guide.
6. J Paulo Davim, Green Manufacturing: Processes and Systems, Springer, 2012.
7. David A Dornfeld, Green Manufacturing: Fundamentals and Applications, Springer, 2013

REFERENCE BOOKS:

1. Athanasios V Alavanidis, Thomais Vlachogianni, *Green Chemistry and Green Engineering*, Synchrona Themata, 2012.
2. G.D. Rai, *Non-conventional Energy Sources*, Khanna Publishers, Delhi, 5th Edition, 2011.
3. Marty Poniatowski, *Foundation of Green Information Technology, Prentice Hall, 2009.*
4. R. K. Gautham, *Green Homes*, BS Publications, 2009.

III B.Tech. - II Semester

(16BT70413) INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Introduction to the concept of nano; Description of nanomaterial; Nanostructure characterization tools; Classification of nanomaterials; Fabrication of nanomaterial; Different applications of nanostructures and nanomaterials.

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

CO1. Demonstrate knowledge in
- a) Nanoscale technology.
- b) Difference between micro and nanotechnology
- c) Classification of Nanostructure and Nanomaterial
- d) Fabrication of various nanomaterials and nanostructures.

CO2. Analyze numerical and analytical problems in
- a) Nanomaterial size by using Scanning Electron Microscope and X-Ray diffraction

CO3. Design and fabricate devices based on nanostructures like
- a) Nano solar cell
- b) Nano cantilever
- c) Nano bio-sensor

CO4. Synthesize nano particle of different materials to solve the problems related to fabrication of nanostructures.

CO5. Select appropriate technique for fabrication of nanostructures and nanocomposites.

CO6. Apply ethical standards and legal issues while using chemical substances in fabrication of new nanostructures.

DETAILED SYLLABUS:

UNIT - I: FUNDAMENTALS OF NANOTECHNOLOGY (08 Periods)

Introduction – Scientific revolutions, Time and length scale in structures, Definition of a nanosystem; Dimensionality and size dependent phenomena - Surface to volume ratio Fraction of surface atoms, Surface energy and surface stress, surface defects, Properties at nanoscale (optical, mechanical, electronic, and magnetic).

UNIT - II: IDENTIFICATION AND CHARACTERIZATION TOOLS FOR NANOMATERIALS AND NANOSTRUCTURE (10 Periods)

Field Emission Scanning Electron Microscopy (FESEM), Environmental Scanning Electron

Microscopy (ESEM) High Resolution, Transmission Electron Microscope (HRTEM), Scanning Tunneling Microscope(STM), Surface enhanced Raman spectroscopy (SERS), Secondary Ion Mass Spectroscopy, Focused Ion Beam Photoelectron Spectroscopy, X-ray Photoelectron Spectroscopy (XPS), Auger electron spectroscopy (AES), Rutherford backscattering spectroscopy (RBS), X-Ray Diffraction, Intensities in X-Ray Scattering Particle Size Effect.

UNIT - III: CLASSIFICATION OF NANOMATERIALS (10 Periods)

Classification based on dimensionality, Quantum Dots, Wells and Wires-III-V Nanoparticles, Electronic Structure of Nanosemiconductor, Carbon based nanomaterials (buckyballs, nanotubes, graphene), Metal based nano materials (nanogold, nanosilver and metal oxides), Nanocomposites, Nanopolymers, Nanoglasses, Nano ceramics, Biological nanomaterials, Fulrene-discovery and early years,.

UNIT - IV: SOME FABRICATION TECHNIQUES OF NANOMATERIALS AND NANOSTRUCTURES (09 Periods)

Chemical Methods: Metal Nanocrystals by Reduction, Solvothermal Synthesis, Photochemical Synthesis, Sonochemical Routes, Chemical Vapor Deposition (CVD), Metal Oxide Chemical Vapor Deposition (MOCVD), Plasma Enhanced Chemical Vapour Deposition Technique (PECVD), Hydrothermal Method, Sol-Gel.
Physical Methods: Ball Milling, Electrodeposition, Spray Pyrolysis, Flame Pyrolysis, DC/RF Magnetron Sputtering, Molecular Beam Epitaxy (MBE) Thermal Evaporation Method.

UNIT - V: APPLICATIONS (08 Periods)

Solar energy harvesting, Catalysis, Molecular electronics and printed electronics Nanoelectronics, Polymers with a special architecture, Liquid crystalline systems, Linear and nonlinear optical and electro-optical properties, Applications in displays and other devices, Nanomaterials for data storage, Photonics, Plasmonics, Chemical and biosensors, Nanomedicine and Nanobiotechnology, MESFET.

Total Period s: 45

TEXT BOOKS:

1. Pradeep T., *A Textbook of Nanoscience and Nanotechnology*, Tata McGraw-Hill Education Pvt. Ltd., 2012.
2. Hari Singh Nalwa, *Nanostructured Materials and Nanotechnology*, Academic Press, 2002.

REFERENCE BOOKS::

1. Nabok A., *Organic and Inorganic Nanostructures*, Artech House, 2005.
2. Dupas C., Houdy P., Lahmani M., *Nanoscience: Nanotechnologies and Nanophysics*, Springer - Verlag Berlin Heidelberg, 2007.
3. S.M. Sze, Physics of Semiconductor Devices, Second Edition 2001.

III B.Tech. – II Semester

(16BT60505) ENGINEERING SYSTEM ANALYSIS AND DESIGN

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION:

Systems Process; Technologies for Systems; System Development Life Cycle; System Analysis and Modeling; Levels of Management; Project Management; Systems Implementation and Importance of UML Prototyping; Maintaining and Managing the Systems Output Process.

COURSE OUTCOMES: On successful completion of this course, the student will be able to:

CO1. Demonstrate knowledge in

a) Systems Process and System Design
b) Systems Analysis and Modeling
c) System Development Life Cycle
d) Design Management and Maintenance Tools.

CO2. Analyze System Process and estimate the given models by using case tools.

CO3. Design and Develop a model to the organizational systems.

CO4. Solve complex problems related to engineering systems and produce accurate results.

CO5. Apply object oriented techniques for modeling dynamic systems.

CO6. Contribute towards societal issues and responsibilities in designing, modeling and developing of organizational systems.

DETAILED SYLLABUS:

UNIT – I: INTRODUCTION (09 Periods)

Systems, Types of systems, Integrating technologies for systems, Need for system analysis and design, Role of the systems analyst, System development life cycle, CASE tools for analysis and design.

UNIT – II: ANALYSIS AND MODELING ORGANIZATIONAL SYSTEM (09 Periods)

Organization as system, System analysis, Depicting systems graphically, Use case modeling, Levels of management, Organizational culture.

UNIT – III: PROJECT MANAGEMENT (10 Periods)

Project initiation, Problem in organization, Determining feasibilities, Ascertaining hardware and software needs, Identifying, Forecasting, Comparing costs and benefits, Activity planning and control, Managing the project.

UNIT - IV: OBJECT ORIENTED ANALYSIS AND DESIGN USING UML (08 Periods)

Introduction, Object modeling, Dynamic modeling, functional modeling, packages and other UML artifacts, the importance of using UML for modeling.

UNIT - V: DESIGNING EFFECTIVE OUTPUT (09 Periods)

Output design objectives, Relating output content to output method, Realizing how output bias affects users, Designing output for display, Case studies-Designing a web site management, Online exam management, Online portal design.

Total Periods: 45

TEXT BOOK:

1. Kenneth E. Kendall and Julie E. Kendall, "System Analysis and Design," Pearson Education, Ninth Edition, 2011.

REFERENCE BOOKS:

1. Dennis, Wixom and Roth, "Systems Analysis and Design," John Wiley, Fifth Edition, 2012.
2. Shelly and Rosenblatt, "Systems Analysis and Design," Cengage Learning, Ninth Edition, 2012.

III B.Tech. – II Semester

(16BT71011) MICRO-ELECTRO-MECHANICAL SYSTEMS

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Overview of Micro Electro Mechanical Systems (MEMS); scaling laws; working principles of microsensors and microactuators; materials; microfabrication processes; packaging of Microsystems.

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

CO1. Demonstrate knowledge on MEMS devices, scaling laws, microsensors and microactuators.
CO2. Analyze the properties of materials and identify its suitability for MEMS devices.
CO3. Design MEMS devices that meet desired specifications and requirements.
CO4. Analyze and synthesize the information to provide effective solution to engineering problems with MEMS devices.
CO5. Use modern techniques in micro manufacturing process.
CO6. Develop efficient and cost effective MEMS based products for society.

DETAILED SYLLABUS:

UNIT - I: OVERVIEW OF MEMS AND SCALING LAWS (09 periods)

MEMS and Microsystems, Microsystems and microelectronics, miniaturization, applications of MEMS in the automotive industry and in other industries.

Scaling Laws of Miniaturization: Introduction to scaling, scaling in: geometry, rigid- body dynamics, electrostatic forces, electromagnetic forces, Electricity, Fluid mechanics, Heat transfer.

UNIT - II: **WORKING PRINCIPLES OF MICROSYSTEMS** **(09 periods)**

Microsensors, acoustic wave sensors, biomedical and biosensors, chemical sensors, pressure sensors, thermal sensors. Microactuation: actuation using thermal forces, shape-memory alloys, piezoelectric crystals, electrostatic forces. MEMS with microactuators, microgrippers, micromotors, microvalves, micropumps. Microaccelerometers, microfludics.

UNIT - III: MATERIALS FOR MEMS AND MICROSYSTEMS **(09 periods)**

Substrate and wafers, silicon as a substrate material, silicon compounds, silicon piezoresistors, gallium arsenide, quartz, piezoelectric crystals, polymers, carbon nano tube (CNT), development of CNTs, application of CNTs.

UNIT - IV: MEMS FABRICATION PROCESS AND MICRO MANUFACTURING **(09 periods)**

Photolithography, ion implantation, diffusion, oxidation, chemical vapor deposition, physical vapor deposition, deposition by epitaxy, etching, bulk micromanufacturing, surface micromanufacturing, LIGA process.

UNIT - V: MEMS PACKAGING **(09 periods)**

Introduction to microsystem packaging, objectives and general considerations in packaging design, three levels of microsystem packaging, interfaces in microsystem packaging, packaging technologies, three-dimensional packaging, selection of packaging materials, signal mapping and transduction, Design case: Pressure sensor packaging.

Total Periods: 45

TEXT BOOK:

1. Tai-Ran Hsu, *MEMS & Microsystems, Design and Manufacture*, McGraw-Hill Education (India) Pvt. Ltd., 2002.

REFERENCE BOOKS:

1. G.K.Ananthasuresh, K.J.Vinoy, Micro *and Smart Systems*, Wiley India, 2010.
2. Nitaigour Premchand Mahalik, *MEMS*, McGraw-Hill Education (India) Pvt. Ltd., 2007.

III B.Tech. – II Semester

(16BT61205) CYBER SECURITY AND LAWS

(Open Elective)

(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITES: -

COURSE DESCRIPTION: Cyber Crimes and Indian IT Act; Cyber Offenses; Tools and Methods used in Cyber Crime; Phishing ad Identity Theft; Indian and Global Perspective on Cyber Crimes and Cyber Security; Organizational Implications on Cyber Security; IPR Issues; Cyber Crime and Terrorism; Cyber Crime Illustrations.

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

CO1. Demonstrate knowledge in Cyber security, Cyber crimes and its related laws in Indian and Global Act.
CO2. Analyze the legal perspectives and laws related to cyber crimes in Indian context.
CO3. Apply security and privacy methods in development of modern applications and in organizations to protect people and to prevent cyber crimes.
CO4. Solve Cyber security issues using privacy policies.
CO5. Use antivirus tools to minimize the impact of cyber threats.
CO6. Follow security standards for the implementation of Cyber Security and laws

DETAILED SYLLABUS:

UNIT - I: INTRODUCTION TO CYBER CRIMES AND OFFENSES (09 Periods)

Cyber Crimes: Introduction, Definition, Origin, Cyber crime and information security, Cyber criminals, Classifications of cyber crimes, The legal perspectives and Indian perspective, Cyber crime and Indian ITA 2000, Global perspective on cyber crimes.
Cyber Offenses: Introduction, Criminals planning on attacks, Social engineering, Cyber stalking, Cyber cafe and crimes, Botnets.

UNIT - II: TOOLS AND METHODS USED IN CYBER CRIME & PHISHING AND IDENTITY THEFT (09 Periods)

Introduction, Proxy servers and Anonymizers, Phishing, Password cracking, Key loggers and Spywares, Virus, Worms and Ransomware, Trojan horses and Backdoors, Steganography, DoS and DDoS attacks.

Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

UNIT - III: CYBER CRIMES AND CYBER SECURITY-LEGAL PERSPECTIVES (08 Periods)

Introduction, Cyber laws in Indian context, The Indian IT act, Challenges to Indian law and Cyber crime scenario in India, Consequences of not addressing the weakness in IT act, Digital signatures and the Indian IT Act, Cyber Crime and Punishment, Cyberlaw, Technology and Students in India scenario.

UNIT - IV: CYBER SECURITY-ORGANIZATIONAL IMPLICATIONS (10 Periods)

Introduction, Web threats for organizations – evils and perils, Security and privacy implications from cloud computing, Social Media Marketing-Security risks and Perils for organizations, Social computing and associated challenges for organizations, Protecting people's privacy in organization, Organizational guidelines for internet usage, Safe computing and Usage policy, Incident handling and Best practices.

UNIT - V: CYBER CRIME & TERRORISM AND ILLUSTRATIONS (09 Periods)

Cyber Crime & Terrorism: Introduction, Intellectual property in the cyber space, The ethical dimension of cyber crimes, The psychology, Mindset and skills of hackers and cyber criminals, Sociology of cyber criminals, Information warfare.

Cyber Crime Illustrations: Indian banks lose millions of rupees, Justice vs. Justice, Parliament attack, The Indian case of online gambling, Bank and credit card related frauds, Purchasing goods and services scam, Nigerian 419 scam.

Total Periods: 45

TEXT BOOK:

1. Nina Gobole and Sunit Belapure, *Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Wiley India, 2011.

REFERENCE BOOK:

1. Prashant Mali, *Cyber Law and Cyber Crimes*, Snow White Publications Pvt. Ltd., 2013.

III B.Tech. – II Semester
(16BT61505) **BIOINFORMATICS**
(Open Elective)
(Common to CSE, CSSE, IT, CE & ME)

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

PRE-REQUISITE:-

COURSE DESCRIPTION: Introduction to Bioinformatics; Biology and Information; Sequence alignment and dynamic programming; Biological Database; Homology Modeling; Structure Prediction; Molecular Dynamics

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

CO1. Demonstrate knowledge on concepts of biological databases, Genome and proteome.
CO2. Analyze biological sequences for Homology Modeling.
CO3. Apply clustering methods for Phylogenetic trees.
CO4. Solve bio sequencing problems using dynamic programming.
CO5. Select and apply appropriate techniques and tools to structure Prediction

DETAILED SYLLABUS:

UNIT - I: NUCLEIC ACIDS, PROTEINS, AND AMINO ACIDS (08 periods)

Bioinformatics-Definition, Nucleic acid structure, Protein structure, the central dogma, Physico-chemical properties of the amino acids and their importance in protein folding, Polymerase chain reaction (PCR)

UNIT - II: INFORMATION RESOURCES FOR GENES AND PROTEINS (10 periods)

Database file formats, Nucleic acid sequence databases, Protein sequence databases **Sequence Alignment Algorithm:** Pair wise sequence alignment – The problem, Pair wise sequence alignment – Dynamic programming methods, The effect of scoring parameters on the alignment, Multiple sequence alignment.

UNIT - III: PREDICTION OF THE THREE-DIMENSIONAL STRUCTURE OF A PROTEIN AND HOMOLOGY MODELING (09 Periods)

Secondary Structure Prediction, Basic Principles, The Steps of Comparative Modeling, Accuracy of Homology Models, Manual versus Automatic Models, SNPs, Motifs**.**

UNIT - IV: PHYLOGENETIC METHODS (10 periods)

Phylogenetic trees, choosing sequences, Distance matrices and clustering methods, Calculation of distances in the neighbor-joining method, Bootstrapping, Tree

optimization criteria and tree search methods, The maximum-likelihood criterion, Calculating the likelihood of the data on a given tree, The parsimony criterion.

UNIT - V: NEW FOLD MODELING (08 periods)

Estimating the Energy of a Protein Conformation, Energy Minimization, Molecular Dynamics, The "Omics" Universe**-**Transcriptomics, Proteomics, Interactomics, Structural Genomics, Pharmacogenomics**.**

TEXTBOOKS:

1. Paul G. Higgs and Teresa K. Attwood, *Bioinformatics and Molecular Evolution* Blackwell Publishing, 2005.
2. Anna Tramontano, *Introduction to Bioinformatics* Chapman and Hall/CRC 2006

REFERENCE BOOKS::

1. Hooman H. Rashidi and Lukas K. Buehler, *Bioinformatics Basics, Applications in Biological Science and Medicine*, CRC Press, Taylor & Francis Group, 2nd Edition, 2005.
2. Rastogi S. C., NamitaMendiratta and Parag Rastogi, *Bioinformatics: Methodsand Applications: Genomics, Proteomics and Drug Discovery*, PHI Learning Pvt. Ltd., 3rd Edition, 2011.

III B.Tech. – II Semester
(16BT60131) COMPUTER AIDED DESIGN AND DETAILING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: Courses on Reinforced Cement Concrete Structures, Design of 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: On successful completion of this course, the students will be able to:

CO1. Explain the knowledge on computer aided design of RCC and steel structures using software tools.
CO2. Analyze RCC and steel structures using software tools.
CO3. Design RCC and steel structures using software tools.
CO4. Solve complex RCC and steel structural design problems using software tools and suggest suitable solutions.
CO5. Use appropriate techniques in modeling, analysis and design of RCC and steel structures using software tools.
CO6. Apply contextual knowledge to assess the safety and serviceability of the structures designed.
CO7. Follow relevant IS Codes for the design of RCC and steel structures using software tools.
CO8. Function effectively as an Individual and as a team member in the design of RCC and steel structures using software tools.
CO9. Communicate effectively on the design of RCC and steel structures using software tools in written, oral and graphical forms.

DETAILED SYLLABUS:

SOFTWARE: STAAD.Pro or any other industry popular structural analysis and design softwares.

LIST OF EXERCISES

1. Analysis and design of simply 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. V. L. Shah and S. R. Karve, *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, 1992.

REFERENCE BOOKS:

1. IS 456 – 2000
2. IS 800 – 2007
3. IS 875 Part – I, II & III – 2000
4. Relevant IRC Code.
5. SP-16 – 1980: *Design Aids for Reinforced Concrete*, Bureau of Indian Standards, New Delhi.
5. SP-34 – 1987: *Hand Book on Concrete Reinforcement* and Detailing, Bureau of Indian Standards, New Delhi.

III B.Tech. II Semester
(16BT60132) HIGHWAY ENGINEERING LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PREREQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Highway material testing – Aggregates, Bituminous materials, Bituminous mixes; Pavement evaluation; Traffic studies.

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

CO1. Demonstrate practical knowledge on highway material testing, pavement evaluation and traffic studies.

CO2. Characterize highway materials, pavements and traffic.

CO3. Design bituminous mix for pavements.

CO4. Solve complex engineering problems associated with highway materials, pavements and traffic through suitable investigations.

CO5. Use modern tools and techniques appropriate in highway material testing, pavement evaluation and traffic studies.

CO6. Ensure health and safety in highway material testing, pavement evaluation and traffic studies.

CO7. Encourage sustainable and environmental friendly highway materials, pavement evaluation methods and traffic studies.

CO8. Maintain ethical standards for quality in highway material testing, pavement evaluation and traffic studies following relevant IS codes.

CO9. Function effectively as an individual, and as a member or leader in teams to solve highway and traffic engineering problems.

CO10. Communicate effectively on highway material testing, pavement evaluation and traffic studies in written, oral and graphical forms.

CO11. Promote cost effective highway materials.

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 (Gmm) 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 Bump Integrator

(E) TRAFFIC STUDIES

21. Spot speed studies
22. Traffic volume studies at mid-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., Justo, C. E. G. and Veeraragavan, A., *Highway Engineering, Nem* Chand & Bros, Roorkee, Revised 10th Edition, 2014.

Note: A minimum of fourteen experiments are to be performed covering all sections.

III B.Tech. – II Semester
(16BT60133) **SEMINAR**

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

PREREQUISITES: All the courses of the program up to III B. Tech. – I Semester.

COURSE DESCRIPTION: Identification of topic for the seminar; Literature survey; Performing critical study and analysis of the topic identified; Preparation of report and presentation.

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

CO1. Knowledge on the seminar topic.
CO2. Analytical ability exercised during the seminar work.
CO3. Ability to investigate and solve complex engineering problems faced during the seminar work.
CO4. Ability to apply techniques to complex engineering activities with an understanding of limitations as applied in the seminar work.
CO5. Ability to function effectively as an individual as experienced during the seminar work.
CO6. Ability to present views cogently and precisely on the seminar topic.
CO7. Ability to engage in life-long leaning as experience during the seminar work.

IV B.Tech. – I Semester
(16BT70101) ESTIMATION AND QUANTITY SURVEYING

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

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Surveying, Computer Aided Building Planning and Drawing.

COURSE DESCRIPTION: Estimation of residential buildings; Estimation of different structures; Specifications and rate analysis; Contracts and Tenders; Valuation.

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

CO1. Demonstrate the basic knowledge on estimation of civil engineering structures, specifications, rate analysis, contracts, tenders and valuation.
CO2. Analyze estimates for different structures, rates, specifications, contracts, tenders and valuation.
CO3. Provide solutions to problems associated with valuation, contracts and tenders by proper interpretation.
CO4. Use appropriate techniques for estimation and valuation of civil engineering structures.
CO5. Consider societal and legal issues in contracts and tenders.
CO6. Maintain ethical standards in estimation, valuation, contracts and tenders.
CO7. Prepare contracts, tenders and valuation reports for various civil engineering projects.
CO8. Prepare contacts and tenders considering financial issues.

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, Colour 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 for panelled and glazed doors, windows, ventilators etc.

UNIT - II: ESTIMATION OF DIFFERENT STRUCTURES (10 Periods)
Estimating different structures - Septic tank, Soak pit, Sanitary and water 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

TEXT BOOKS:

1. Dutta. B. N., *Estimating and Costing in Civil Engineering*, UBS Publishers &Distributors Pvt. Ltd., 27th Edition, 2003.
2. Kohli, D. D and Kohli, R. C., *A Text Book of Estimating and Costing (Civil)*, S. Chand & Company Ltd., 12th Edition, 2004.

REFERENCE BOOKS:

1. M. Chakraborthi, *Estimating Costing Specification and Valuation in Civil Engineering*, Laxmi Publications, New Delhi, 23rd Edition, 2010.
2. Standard Schedule of Rates and Standard Data Book, Public Works Department.
3. IS 1200 (Parts I to XXV – 1974/ *Method of Measurement of Building and Civil Engineering Works* – B.I.S).
4. National Building Code of India, BIS, Government of India, New Delhi, 2005.

IV B. Tech. – I Semester
(16BT70102) GEOSPATIAL TECHNOLOGIES

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

PRE-REQUISITES: Course on Surveying.
COURSE DESCRIPTION: Photogrammetry; Remote sensing; Geographic information system; GIS Spatial analysis; Remote sensing and GIS applications.

COURSE OUTCOMES: On successful completion of this course, the students will be able to:
CO1. Demonstrate the basic knowledge on photogrammetry, remote sensing and geographic information system and their applications.
CO2. Analyze the spatial data and non spatial data.
CO3. Develop thematic maps using RS and GIS data for engineering applications.
CO4. Conduct investigations to provide valid conclusions in geospatial applications.
CO5. Apply suitable techniques to predict and model the damages due to natural disasters.
CO6. Provide geospatial solutions ensuring societal safety.
CO7. Consider the environmental sustainability issues in geospatial applications.

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.

UNIT – II: REMOTE SENSING (10 Periods)
Elements of remote sensing, Electromagnetic spectrum, Energy resources, Physics of radiant energy, Energy interactions with earth surface features and atmosphere, 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.

UNIT – IV: GIS SPATIAL ANALYSIS (07 Periods)

Database models, Data storage, Vector data storage, Attribute data storage, Overview of the data manipulation and analysis, Integrated analysis of the spatial and attribute data, Basics of global positioning system.

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.

Total Periods: 45

TEXT BOOKS:

1. B. Bhatta, *Remote Sensing and GIS*, Oxford University Press, 2nd Edition, 2011.
2. M. Anji Reddi, *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 J. W. Chipman, *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 Geogrphic Information System*, Narosa Publishing House, 2nd Edition, 2015.
3. Narayana Panigrahi, *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.

IV B.Tech. – I Semester
(16BT70103) RAILWAY, AIRPORT AND HARBOUR ENGINEERING

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

PRE-REQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Railway Engineering; Construction and maintenance of railway tracks; Airport planning; Airport design; Harbour engineering.

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

CO1. Demonstrate the basic knowledge on railway, airport and harbour engineering.
CO2. Analyze railway, airport and harbour engineering problems.
CO3. Design elements of railways and airports.
CO4. Solve problems associated with railway, airport and harbour engineering through proper investigations, analysis and interpretation.
CO5. Use appropriate techniques in solving railway, airport and harbour engineering problems.
CO6. Provide solutions to railway, airport and harbour engineering problems considering health and safety in the context of society.
CO7. Consider the environmental issues while solving railway, airport and harbour engineering problems.
CO8. Follow standards for planning and design of Railways, Airports and Harbours.

DETAILED SYLLABUS:

UNIT - I: RAILWAY ENGINEERING (10 Periods)

Development of railways in India, Advantages of railways, Classification of Indian railways, Permanent way – Cross section, Components, Functions; Rail joints, Welding of rails, Concept of gauges, Coning of wheels, Creep of rails, Adzing of sleepers, Route alignment surveys - Conventional and modern methods; Soil suitability analysis, Track geometric design, Points and crossings, Signals, Interlocking.

UNIT - II: CONSTRUCTION AND MAINTAINANCE OF RAILWAY TRACKS (08 Periods)

Earthwork, Stabilization of track on poor soil, Drainage, Calculation of materials required for track laying, Construction and maintenance of tracks, Modern methods

of construction and maintenance, Railway stations and yards and passenger amenities, Urban rail, Infrastructure for metro, mono and underground railways.

UNIT - III: AIRPORT PLANNING (10 Periods)

Air transport characteristics, Aircraft characteristics, Airport classification, Air port planning - Objectives, Components, Layout characteristics; Airport site selection - Site surveys and drawings; Terminal area - Functions, Site location; Noise control, Aprons, Gate positions and parking system, Airport markings, Airport lighting, Typical layouts.

UNIT - IV: AIRPORT DESIGN (09 Periods)

Runway design – Orientation, Wind rose diagram, Length, Geometric design, Configuration and pavement design principles, Lighting system; Airport grading, Elements of taxiway design, Airport zones, Passenger facilities and services, Runway and taxiway markings and lighting, Characteristics and requirements of airport drainage.

UNIT - V: HARBOUR ENGINEERING (08 Periods)

Significance, Advantages and limitations of water transport, Harbour - Classification and site selection, Port – Layout, Components, Functions, Classification, Site selection; Docks – Types, Functions; Inland water transport, Natural phenomenon – Tides, Winds, Waves, Currents, Drift; Navigational aids.

Total Periods: 45

TEXT BOOKS:

1. S. P. Saxena and S. P. Arora, *Railway Engineering – A Text Book of Transportation Engineering*, S. Chand and Co. Ltd., 7th Edition, 2010.
2. Khanna. S. K., Arora. M. G., and Jain, S. S. *Airport planning and Design*, Nem Chand and Bros, 6th Edition, 2012.
3. S. C. Rangwala, *Harbor Engineering*, Charotar Publishing House, 7th Edtion, 2013.

REFERENCE BOOKS:

1. Chandra S. and M. M. Agarwal, *Railway Engineering*, Oxford University Press, 2nd Edition, 2007.
2. S. K. Khanna and Arora, *Airport Planning and Design*, Nemchand and Brothers, 6th Edition, 2012.
3. Seetharaman, S., *Dock and Harbour Engineering*, Umesh Publications, 1999.

IV B.Tech. - I Semester
(16BT70104) ADVANCED FOUNDATION ENGINEERING
(Program Elective – 2)

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

PRE-REQUISITES: Courses on Soil Mechanics, Foundation Engineering.

COURSE DESCRIPTION: Shallow foundations- Advanced bearing capacity theories, Design principles of shallow foundations; Pile foundations; Sheet pile walls; Foundations in problematic soils - Underreamed pile foundations; Marine substructures.

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

CO1. Demonstrate knowledge on advanced theories of bearing capacity and settlement of shallow and pile foundations; sheet pile walls, foundations on expansive soils and marine sub structures.
CO2. Analyze footings for bearing capacity and settlements, sheet piles for stability and marine substructures.
CO3. Proportion and design all types of foundations, sheet piles and break waters.
CO4. Provide solutions to complex foundation engineering problems.
CO5. Use appropriate techniques for the analysis and design of foundations, sheet piles and marine substructures.
CO6. Ensure stability and safety in the design of foundations, sheet piles and marine substructures.
CO7. Follow IS Codes to design foundations, sheet piles and break waters.
CO8. Communicate effectively on advanced foundation engineering problems in written and graphical forms.

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-á, â and ë 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 and lateral 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 supported method, Fixed earth support method; Lateral earth pressure on braced sheet pile walls.

UNIT – IV: FOUNDATIONS ON EXPANSIVE SOILS

(08 Periods)

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, Sea walls, Docks, Quay walls; Design loads, Wave action, Wave pressure on vertical wall, Ship impact on piled wharf structure, Design of rubble mount break water and wall type break water.

Total Periods: 45

TEXT BOOKS:

1. Donald P. Coduto, *Foundation Design Principles and Practices*, PHI, 3rd Edition, 2008.
2. Swami Saran, *Analysis and Design of Substructures – Limit State Design,* Oxford & IBH Publishing Company Pvt. Ltd., 2nd Edition 2010.

REFERENCE BOOKS:

1. V. N. S. Murthy, *Text Book of Soil Mechanics and Foundation Engineering,* CBS Publishers & Distributors Pvt. Ltd., 3rd Edition, 2010.
2. Braja M. Das, Principles *of Foundation Engineering,* Cengage Learning India, 7th Edition, 2010.
3. Bowles J.E., *Foundation Analysis and Design,* McGraw–Hill Publishing Company, 5th Edition, 2001.
4. Shamsher Prakash, Gopal Ranjan and Swami Saran, *Analysis and Design of Foundations and Retaining Structures,* Sarita Publishers, 2nd Edition, 1987.

IV B.Tech. I Semester

(16BT70105) ARCHITECTURE AND TOWN PLANNING

(Program Elective – 2)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	-	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: On successful completion of this course, the students will be able to:

CO1. Demonstrate knowledge on architecture and town planning.
CO2. Identify the regional and urban related problems by analyzing the principles of architecture design and town planning practices in India.
CO3. Design and develop a town plan by using various models of urban structure.
CO4. Use information system approach and appropriate techniques for better land use planning.
CO5. Ensure safety and performance standards in integration of building architecture and services.
CO6. Use environmentally sustainable approach in architecture and town planning.
CO7. Maintain ethics in architecture and town planning by following building rules and regulations.
CO8. Communicate effectively in the form of layouts pertain to architecture and town planning.

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, Interior

design, 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*

TEXT BOOKS:

1. Biswas Hiranmay, *Principles of Town Planning and Architecture*, Vayu Education of India, 2012.
2. Satish Chandra Agarwala, *Architecture and Town Planning*, Dhanpat Rai and Company, 2008.

REFERENCE BOOKS:

1. Rangwala, K. S., *Town Planning*, Charotar Publishing House, 2014.
2. Hiraqskar, G. K., *Fundamentals of Town Planning*, Dhanpat Rai & Sons, 2001.
3. Bandopadhyay, A., *Text Book of Town Planning*, Books and Allied, 2000.
4. Faludi, Andreas, *Planning Theory*, Pergamon Press, 1973.
5. Muthu Shoba Mohan, G., *Principles of Architecture*, Oxford University Press, New Delhi, 2006.

IV B.Tech. I Semester
(16BT70106) ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT
(Program Elective – 2)

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

PREREQUISITES: Courses on Environmental Studies, Water Supply Engineering, Wastewater Technology.

COURSE DESCRIPTION: Environmental impact assessment (EIA); EIA methodologies; Environmental impact on soils, ground water and surface water; Environmental impact assessment on air, vegetation and wild life; Environmental audit and acts.

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

CO1. Gain basic knowledge on EIA, EIA methodologies, environmental audits and acts and preparation of EIA reports for various projects.
CO2. Analyze factors, elements, methodologies and reports of EIA; environmental audits and acts.
CO3. Interpret EIA and audit reports to provide solutions for environmental problems.
CO4. Use appropriate methods to prepare EIA and audit reports.
CO5. Consider health and safety in EIA.
CO6. Give suitable recommendations based on EIA study for sustainable development.
CO7. Follow environmental acts in EIA.
CO8. Prepare EIA and audit reports.

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 and classification 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.

UNIT – III: EIA ON SOIL, GROUND WATER AND SURFACE WATER (10 Periods)

Prediction and assessment, Soil quality, Methodology for the assessment of soil and groundwater – Delineation of study area, Identification of activities, Impact prediction, Assessment of impact significance, Identification and incorporation of mitigation measures; EIA on surface water - Methodology for the assessment of impacts on surface water environment, Watershed management schemes.

UNIT–IV: EIA ON AIR, VEGETATION AND WILDLIFE (08 Periods)

Air pollution sources, Generalized approach for assessment of air pollution impact on various anthropogenic activities, Assessment of impact of developmental activities on vegetation and wildlife, Environmental impact of deforestation – Causes and effects of deforestation.

UNIT – V: ENVIRONMENTAL AUDIT, ACTS AND MANAGEMENT (10 Periods)

Environmental audit and environmental legislation, Objectives of environmental audit, Types of environmental audit, Audit protocol, Stages of environmental audit, Onsite activities, Evaluation of audit data and preparation of audit report, Post audit activities, Environmental Acts - Environmental protection act, The water act, The air act, Wild life act; Case studies - Preparation of EMP report and EIA statement for various projects; Environmental management systems.

Total Periods: 45

TEXT BOOKS:

1. Y. Anjaneyulu, *Environmental Impact Assessment Methodologies,* B . S . Publications, 2nd Edition, 2007.
2. J. Glynn and Gary W. Heinke, *Environmental Science and Engineering,* Prentice Hall, 2nd Edition, 1996.

REFERENCE BOOKS:

1. Suresh K. Dhameja, *Environmental Engineering and Management,* S.K. Kataria and Sons, 2010.
2. H. S. Bhatia, *A Text Book of Environmental Pollution and Control,* Galgotia Publications (P) Ltd., 2003.
3. Charless H. Eccleston, *Environmental Impact Assessment*, CRC Press, Taylor and Francis Group, 2011.
4. Balakrishna Moorthy, *Environmental Management*, PHI Publications, 2nd Edition, 2008.

IV B. Tech. – I Semester

(16BT70107) GLOBAL POSITIONING SYSTEM

(Program Elective – 2)

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

PRE-REQUISITES: Course on Physics.

COURSE DESCRIPTION: Geodesy; Overview of Global Positioning System (GPS); GPS signal structure; GPS Errors and accuracy; GPS surveying and applications.

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

CO1. Demonstrate the knowledge on geodesy, GPS signal structure, GPS errors and accuracy, GPS surveying and applications for civil engineering structures.
CO2. Analyze problems associated with GPS and GPS surveying.
CO3. Conduct investigations and give recommendations for boundary and locations, specific land surveying issues.
CO4. Use modern methods and apply suitable techniques in collecting waypoints, recording tracks, navigating to a position.
CO5. Consider societal issues in practicing GPS survey.
CO6. Follow ethics in GPS survey practice.
CO7. Understand and manage projects on global positioning satellite data interface and relation in multidisciplinary environments.

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.

Total Periods: 45

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), 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.

IV B.Tech. – I Semester
(16BT70108) STRUCTURAL DYNAMICS
(Program Elective - 2)

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

PRE-REQUISITES: Courses on Engineering Mechanics, Mechanics of Solids, Structural Analysis - I, Structural Analysis - II.

COURSE DESCRIPTION: Principle of vibration analysis; Single degree of freedom, Two degree of freedom and multi–degree of freedom systems; Vibration analysis; Dynamic analysis of continuous systems.

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

CO1. Elucidate the knowledge on theory of vibrations.
CO2. Analyze engineering systems for different modes of vibrations.
CO3. Formulate the complex equation of motions for free vibrations and continuous systems.
CO4. Solve complex engineering problems associated with vibrations by proper modeling and analysis.
CO5. Use appropriate methods to analyze engineering systems for vibrations.
CO6. Ensure sustainability while analyzing engineering systems for vibrations.

DETAILED SYLLABUS:

UNIT – I: SINGLE DEGREE OF FREEDOM (SDOF) SYSTEM (09 Periods)

Single degree of freedom, Alembert's principle, Theory of vibrations, Lumped mass and continuous mass systems, Single degree of freedom (SDOF) systems, Formulation of equations of motion, Undamped and damped free vibration, Damping - Critical damping, Logarithmic decrement.

UNIT – II: TWO DEGREE OF FREEDOM SYSTEMS (09 Periods)

Equations of motion in two degree of freedom systems, Normal mode of vibrations, Applications.

UNIT – III: MULTI–DEGREE OF FREEDOM (MDOF) SYSTEMS (09 Periods)

Formulation of equations of motion, Free vibration, Determination of natural frequencies of vibration and mode shapes, Orthogonal properties of normal modes, Mode superposition method of obtaining response.

UNIT – IV: VIBRATION ANALYSIS (09 Periods)

Vibration analysis, Rayleigh's method, Approximate methods, Improved Rayleigh method**.**

UNIT – V: DYNAMIC ANALYSIS OF CONTINUOUS SYSTEMS (09 Periods)

Differential equation of motion, Transverse vibration of linearly elastic beams, Analysis of undamped free vibration of simply supported and cantilever beams.

Total Periods: 45

TEXT BOOKS:

1. Anil K. Chopra, *Dynamics of Structures*, Pearson Education, 3rd Edition, 2007.
2. Mario Paz, *Structural Dynamics: Theory and Computation*, Kluwer Academic Publication, 2004.

REFERENCE BOOKS:

1. Clough and Penzien, *Dynamics of Structures*, McGraw–Hill International Edition, 3rd Edition, 2008.
2. R. Ayothiraman and Hemanth Hazarika, *Earthquake Hazard Mitigation*, I.K. International Publishing House Pvt. Ltd., 2010.
3. Pankaj Agarwal and Manish Shrikhande, *Earthquake Resistant Design of Structures*, Prentice Hall of India, 2006.
4. S. K. Duggal, *Earthquake Resistant Design of Structures,* Oxford University Press, 2010.

IV B.Tech. - I Semester

(16BT70109) TRANSPORTATION PLANNING AND MANAGEMENT

(Program Elective – 2)

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

PREREQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Transportation planning; Transport demand analysis; Traffic assignment; Landuse transport models and theory of traffic flow; Transport economics; Public transportation–mass transit systems; Scheduling; Planning; Softwares.

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

CO1. Demonstrate the knowledge on transportation planning and management.
CO2. Analyze problems associated with transportation planning and management.
CO3. Develop transportation plans and management systems.
CO4. Solve complex problems in transportation planning and management through proper investigations, analysis and interpretation.
CO5. Use appropriate tools and techniques in transportation planning and management.
CO6. Consider societal issues in transportation planning and management.
CO7. Provide solutions to transportation planning and management problems considering environment.
CO8. Maintain ethics in transportation planning and management practice.
CO9. Consider economical issues in transportation planning and management.

DETAILED SYLLABUS:

UNIT - I: TRANSPORTATION PLANNING (08 Periods)

Transportation planning process, System approach to transportation planning, Stages in transportation planning and difficulties in transportation planning process - Transportation survey, Study area, Zoning; Types of surveys - Inventory of transportation facilities; Land use and economic activities.

UNIT - II: TRANSPORT DEMAND ANALYSIS (09 Periods)

Trip purpose - Factors governing trip generation and attraction, Multiple linear regression analysis; Trip distribution models - Gravity model, Modal spilt models, Probit analysis, Traffic assignment models; Travel demand forecasting, Trip generation analysis, Trip classification – Multiple

regression analysis, category analysis, modal split analysis; Trip distribution analysis - Methods of trip distribution, Uniform and average factor method, Fratarmethod, Furness method, Gravity model; Linear programming approach to trip distribution.

UNIT - III: TRAFFIC ASSIGNMENT, LANDUSE TRANSPORT MODELS AND THEORY OF TRAFFIC FLOW (09 Periods)

Traffic Assignment: Purpose, Techniques - All or nothing assignment, Multiple route assignment, Capacity restraint assignment; Diversion curves, Route building algorithms

Landuse Transport Models: Selection of land, Lowry model, Grain-Lowry model, Applications of Lowry model.

Theory of Traffic Flow: Scope, Definitions and basic relationship, Hydrodynamic analogies, Car following theory, Probabilistic description of traffic flow, Queuing theory as applied to traffic flow problems for study state conditions, Simulation studies.

UNIT - IV: TRANSPORT ECONOMICS AND PUBLIC TRANSPORTATION– MASS TRANSIT SYSTEMS (08 Periods)

Transport Economics: Economic evaluation of highway schemes, Necessity, Cost and benefits of transportation projects, Basic principles of economic evaluation - Net present value method, Benefit/Cost ratio method, Internal rate of return method; Vehicle operating costs, Value of travel time saving, Accident costs.

Public Transportation–Mass Transit Systems: Bus and rail transit, characteristic capacities – Introduction to advanced computational techniques for transportation planning.

UNIT-V: SCHEDULING, PLANNING AND SOFTWARES (11 Periods)

Scheduling: Grouping of plant and machinery; Incorporating in project planning; Preparation of plant schedule.

Planning: WBS, Network development, Resource allocation, Planning and controlling of resources.

Softwares: Primavera and MS Project.

Total Periods: 45

TEXT BOOKS:

1. Kadyali, L. R., *Traffic Engineering and Transportation Planning*, Khanna Publications, 7th Edition, 2012.
2. Chitkara, K. K., *Construction Project Management: Planning, Scheduling and Controlling*, Tata McGraw-Hill Education Pvt. Ltd., 3rd Edition, 2010.

REFERENCE BOOKS:

1. Saxena, S. P. and Arora, S. P. *Railway Engineering – A Text Book of Transportation Engineering,* S. Chand and Co. Ltd., 7th Edition, 2010.
2. Chandola, S. P., *A Text Book of Transportation Engineering*, S. Chand & Co Ltd, 2011.
3. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd, 2005.
4. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning,* Prentice Hall of India Pvt. Ltd., 2006.

IV B.Tech. – I Semester

(16BT70110) WATER RESOURCES SYSTEMS PLANNING AND MANAGEMENT

(Program Elective – 2)

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

PREREQUISITES: Courses on Surveying, Engineering Hydrology, Irrigation Engineering.

COURSE DESCRIPTION: Concepts of water resources system planning and management; Linear programming; Dynamic programming; Non–linear optimization techniques; Simulation; Water resources economics; Water resources management.

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

CO1. Demonstrate the basic knowledge on optimization techniques in systems, planning and management of water resources.
CO2. Analyze optimization techniques and their application in water resources systems, planning and management.
CO3. Develop water resources management systems.
CO4. Solve complex problems associated with water resources systems planning and management through proper analysis and interpretation of data.
CO5. Use and develop appropriate optimization techniques in water resources planning and management.
CO6. Understand the impact of water resources planning and management on society.
CO7. Provide suitable solutions to water resources planning and management problems considering environment sustainability.
CO8. Consider economical issues for cost effective water resources planning and management.

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 OPTIMATIZATION 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.

Total Periods: 45

TEXT BOOKS:

1. S. Vedula and P. P. Mujumdar, *Water Resources Systems*, Tata McGraw–Hill, 5th Edition, 2010.
2. N. Ramanathan, *Operations Research*, TMH Publications, 2005.

REFERENCE BOOKS:

1. P. R. Bhave, *Optimal Design of Water Distribution Networks*, Narosa Publishing House, 2003.
2. P. Sankar Iyer, *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, The Netherlands, 2003.
6. Loucks, D. P. and Beek, E. V., *Water Resources Systems Planning and Management*, UNESCO Publishing, The Netherlands, 2005.
7. Chadurvedi, M. C., *Water Resource Systems Planning and Management*, Tata McGraw-Hill inc., New Delhi, 1997.

IV B.Tech. – I Semester

(16BT70111) ADVANCED STEEL STRUCTURES

(Program Elective - 3)

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

PRE-REQUISITES: Courses on Structural Analysis-I, Structural Analysis-II, Steel Structures.

COURSE DESCRIPTION: Welded plate girders; Gantry girder; Steel water tanks; Composite construction; Grillage foundation.

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

CO1. Gain the knowledge on advanced steel structures: welded plate girders, gantry girder, water tanks, composite construction, grillage foundation and connections.
CO2. Analyze the advanced steel structures and their elements.
CO3. Design advanced steel structures and their elements.
CO4. Provide solutions to complex engineering problems associated with advanced steel construction through proper analysis and design.
CO5. Use appropriate techniques to analyze and design of advanced steel structures and their elements.
CO6. Ensure safety and stability in the design of advanced steel structures and their elements
CO7. Follow IS codes in the design of advanced steel structures and their elements.

DETAILED SYLLABUS:

UNIT - I: WELDED PLATE GIRDERS (10 Periods)

Design of cross section of plate girders, Design of end stiffeners, intermediate stiffeners, bearing stiffeners and horizontal stiffeners.

UNIT - II: GANTRY GIRDER (09 Periods)

Gantry girder impact factors, Longitudinal forces, Design of gantry girders.

UNIT - III: STEEL WATER TANKS (09 Periods)

Specifications, Design of rectangular pressed steel tank.

UNIT - IV: STEEL - CONCRETE COMPOSITE CONSTRUCTION (08 Periods)

Design principles, Shear connections, Composite beam design.

UNIT - V: GRILLAGE FOUNDATION (09 Periods)

Introduction, Design of grillage foundation, Foundation for a single column, Foundation for a two column.

Total Periods: 45

TEXT BOOKS:

1. S. S. Bhavikatti, *Design of Steel Structures*, I. K. International Publishing House Pvt. Ltd., 3nd Edition, 2010.
2. B. C. Punmia, Ashok Kumar Jain and ArunKumar Jain, *Design of Steel Structures,* Laxmi Publications, 2nd Edition, 2013.

REFERENCE BOOKS:

1. S. Ramachandra, *Design of Steel Structures*, Dhanpat Rai Publishing Company, 2nd Edition, 2007.
2. N. Krishna Raju, *Structural Design and Drawing*, Universities Press, 3rd Edition, 2009.
3. S. K. Duggal, *Limit State Design of Steel Structures*, McGraw-Hill, 2nd Edition, 2014.
4. N. Subramanian, *Design of Steel Structures*, Oxford University Press, 2010.

CODES/TABLES:

1. IS: 800–2007: General Construction in Steel – Code of Practice, Steel Tables, **are to be permitted into the examination hall.**

IV B.Tech. – I Semester

(16BT70112) EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Program Elective – 3)

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

PRE-REQUISITES: Courses on Structural Dynamics, Engineering Geology.

COURSE DESCRIPTION: Earthquake engineering; Earthquake analysis; Codal design and detailing provisions; Seismic planning; Shear walls and base isolation techniques.

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

CO1. Acquire the knowledge on seismology and earthquake resistant design of structures.
CO2. Analyze structures for earthquake loading.
CO3. Design earthquake resistant structures.
CO4. Recommend suitable structural elements for earthquake resistant structures.
CO5. Use an appropriate technique for earthquake resistant design of structures.
CO6. Consider stability and safety issues in earthquake resistance design of structures.
CO7. Ensure ethics in earthquake resistant design of structures as per IS Codes.

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: EARTHQUAKE ANALYSIS (09 Periods)

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.

UNIT–III: CODAL DESIGN AND DETAILING PROVISIONS

(11 Periods)

Codal Design Provisions: Review of the latest Indian seismic code IS:1893 – 2002 (Part–I): Provisions for buildings, Earthquake design philosophy – Assumptions, Design by seismic coefficient and response spectrum methods, Displacements and drift requirements, Provisions for torsion.

Codal Detailing Provisions: Review of the latest Indian seismic codes IS: 4326, IS: 13920 and SP – 34 provisions for ductile detailing of R.C buildings – Beam, Column and joints, Soft storey.

UNIT – IV: SEISMIC PLANNING (08 Periods)

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.

UNIT – V: SHEAR WALL AND BASE ISOLATION TECHNIQUES

(09 Periods)

Shear Wall: Types, Design of shear walls as per IS: 13920 – Detailing of reinforcements.

Base Isolation Techniques: Basic concept of seismic base isolation, Various systems and their importance.

Total Periods: 45

TEXT BOOKS:

1. Pankaj Agarwal and Manish Shrikhande, *Earthquake Resistant Design of Structures*, Prentice Hall of India, 2006.
2. S. K. Duggal, *Earthquake Resistant Design of Structures*, Oxford University Press, 2010.

REFERENCE BOOKS:

1. Anil K. Chopra, *Dynamics of Structures*, Pearson Education, 3rd Edition, 2007.
2. Clough and Penzien, *Dynamics of Structures*, McGraw–Hill International Edition, 3rd Edition, 2008.
3. Mario Paz, *Structural Dynamics: Theory and Computation*, Kluwer Academic Publication, 2004.
4. C. V. R. Murty, *Earthquake Tips*, NICEE (www.nicee.org), IIT, Kanpur.

CODE:

IS: 1893-2002: Indian Standard Criteria for Earthquake Resistant Design of Structures, **is to be permitted into the examination hall.**

IV B.Tech. – I Semester
(16BT70113) HIGHWAY CONSTRUCTION AND MAINTENANCE

(Program Elective – 3)

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

PRE-REQUISITES: Course on Highway and Traffic Engineering

COURSE DESCRIPTION: Highway construction; Stabilized roads; Highway drainage, Hill roads; Highway construction equipment; Highway maintenance; Road side development.

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

CO1. Demonstrate the knowledge on highway construction and maintenance.
CO2. Analyze the problems associated with highway construction and maintenance.
CO3. Design highway drainage.
CO4. Solve issues related to highway construction and maintenance through proper investigations and interpretation of data.
CO5. Use appropriate techniques and tools in highway construction and maintenance.
CO6. Consider the societal issues in highway construction and maintenance.
CO7. Provide solutions to the problems in highway construction and maintenance considering environment.
CO8. Follow ethics in highway construction and maintenance.

DETAILED SYLLABUS:

UNIT - I: HIGHWAY CONSTRUCTION (08 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 (08 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.

UNIT-III: HIGHWAY DRAINAGE AND HILL ROADS (10 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 (09 Periods)

Excavators - Drilling rock and earth; Aggregate production – Trucks and haulage equipment, Dozers, Scrappers; Finishing equipment, Hot-mix 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.

UNIT-V: HIGHWAY MAINTENANCE AND ROAD SIDE DEVELOPMENT (10 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

TEXT BOOKS:

1. Khanna, S. K., Justo, C. E. G. and Veeraragavan, A., *Highway Engineering, Nem* Chand & Bros, Roorkee, Revised 10th Edition, 2014.
2. Kadiyali, L. R., *Traffic Engineering and Transport Planning*, Khanna Technical Publications, 7th Edition, 2010.

REFERENCE BOOKS:

1. Subhash C. Saxena, *A Course in Traffic Planning and Design,* Dhanpat Rai Publications, 2nd Edition, 1989.
2. Jotin Khisty, C. and KentLall, B., *Transportation Engineering – An Introduction,* Prentice Hall of India Pvt. Ltd., 3rd Edition, 2006.
3. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd., 2005.
4. Papacostas, C. S. and Prevedouros, P. D., *Transportation Engineering and Planning,* Prentice Hall of India Pvt. Ltd., 2006.

IV B.Tech - I Semester
(16BT70114) INDUSTRIAL WASTEWATER TREATMENT
(Professional Elective – 3)

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

PREREQUISITES: Course on Wastewater Technology.

COURSE DESCRIPTION: Industrial wastewater sources and characteristics; Principles of Primary and biological treatment; Advanced wastewater treatment systems; Typical wastewater treatment systems for different industries; Waste minimization.

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

CEO1. Demonstrate the knowledge on characteristics of industrial wastewater, treatment systems and waste minimization.
CEO2. Analyze characteristics, treatment systems and waste minimization techniques of industrial wastewater.
CEO3. Design wastewater treatment systems.
CEO4. Provide solutions to the industrial wastewater problems by proper investigations and interpretation of data.
CEO5. Use appropriate techniques in the analysis, treatment and minimization of industrial wastewater.
CEO6. Provide solutions for industrial wastewater problems considering society in the context of health and safety.
CEO7. Consider environmental sustainability in solving industrial wastewater problems.
CEO8. Follow standards in the analysis, treatment and minimization of industrial wastewater.

DETAILED SYLLABUS:

UNIT – I: CHARACTERISTICS OF INDUSTRIAL WASTEWATER **(08 Periods)**

Industrial sources of wastewater and characterization, Significance in determination of characteristics for different industrial effluents, Pattern of pollution and self-purification of a stream, ISI tolerance limits for disposal of effluent into inland surface water and public sewers.

UNIT – II: PRIMARY AND BIOLOGICAL TREATMENT **(10 Periods)**

Scope, Working principle and functions - Equalization, Neutralization, Screen chamber, Grit chamber, Primary sedimentation tank; Microbiological metabolism - Basic kinetic

equations, Biological treatment kinetics, Growth kinetics; Complete mix and plug flow systems, Oxygen requirement in aerobic process, Design of conventional biological treatment facilities.

UNIT – III: ADVANCED TREATMENT SYSTEMS (08 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 (10 Periods)

Origin, Characteristics and treatment of wastewater - Pulp and paper mills, Breweries, Wineries, Distilleries, Tanneries, Textile mills, Sugar mills, Refineries and dairy units.

UNIT – V: WASTE 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

TEXT BOOKS:

1. M. N. Rao and A. K. Dutta, *Waste Water Treatment,* Oxford and IBH Publishers, 3rd Edition, 2009.
2. Met Calf 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., 1971.
2. Mark J. Hammer and Mark J. Hammer Jr., *Water and Wastewater Technology,* 6th Edition, 2008.
3. A. D. Patwardhan, *Industrial Wastewater Treatment*, PHI Publisher, 2008.
4. Rakesh Kumar and R. N. Singh, *Municipal Water and Wastewater Treatment*, TERI, 2009.

IV B.Tech. I Semester

(16BT70115) INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

(Program Elective – 3)

Internal Marks	External Marks	Total	L	T	P	C
30	70	100	3	1	–	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: On successful completion of this course, the students will be able to:

CO1. Demonstrate the knowledge on infrastructure development and management in global economy scenario in India.
CO2. Analyze problems associated with infrastructure development and management.
CO3. Formulate legal framework for regulating private partnerships by adopting government policies.
CO4. Use appropriate tools and techniques for better infrastructure development and management.
CO5. Ensure public health care and education in different sectors of infrastructural development projects.
CO6. Use environmentally sustainable approach in infrastructure development and management.
CO7. Maintain ethics in infrastructure development and management by following policies and regulations as per government norms.
CO8. Futuristic plan, monitor and control the finance in infrastructural development projects.

DETAILED SYLLABUS:

UNIT – I: INFRASTRUCTURE DEVELOPMENT (09 Periods)

Impact of Infrastructure development on economic development, Standard of living and environment, Reasons for rise of public sector and government 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 transportations, power and telecom sectors, Plans for infrastructure development, Legal framework for regulating private participation, Roads and highways, Ports & Airports, Power and telecom.

UNIT – IV: CONSTRUCTION AND INFRASTRUCTURE (09 Periods)

Construction component of various infrastructure sectors, Highway, 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*

TEXT BOOKS:

1. Narindar Jetli, K. and Vishal Sethi, *Infrastructure Development in India Post Liberalization Initiatives and Challenges*, New Century Publications, 2007.
2. Raghuram, G. and Jain, R., *Infrastructure Development and Financing towards a Public–Private Partnership*, Macmillan India Ltd., 2002.

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. Anup Chatterjee, Narinder Jetli, K. and Vishal Sethi, *Industry and Infrastructure Development in India since 1947*, New Century Publications, 2009.

IV B.Tech. - I Semester
(16BT70116) SOIL DYNAMICS AND MACHINE FOUNDATIONS

(Program Elective – 3)

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

PRE-REQUISITES: Courses on Soil Mechanics, Foundation Engineering.

COURSE DESCRIPTION: Fundamentals of vibration; Frequency of soil systems; Wave propagation; Dynamic soil properties; Vibration analyses; Design of machine foundations; Machine foundations on piles; Vibration isolation.

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

CO1. Demonstrate knowledge on soil behaviour under dynamic loading, vibration analysis, machine foundations and vibration isolation.
CO2. Analyze dynamic soil properties, vibrations and machine foundations.
CO3. Design machine foundations.
CO4. Investigate the soil properties during wave propagation and suggest suitable foundations.
CO5. Use appropriate techniques for dynamic soil characterization, design of machine foundations and vibration isolation.
CO6. Recommend machine foundations and vibration isolation techniques considering stability and safety.
CO7. Follow IS codes in dynamic soil characterization, design of machine foundations and suggesting vibration isolation techniques.

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.

Frequency of Soil Systems: Determination of viscous damping, Transmissibility, Systems with two and multiple degrees of freedom, Vibration measuring instruments.

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 analysis, 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.

TEXT BOOKS:

1. Das, Braja M. and Ramana, G. V., *Principles of Soil Dynamics,* Cengage Learning Inc., 2nd Edition, 2011.
2. Srinivasulu, P. and Vaidyanathan, C., *Hand Book of Machine Foundations,* Tata McGraw–Hill, 2007.

REFERENCE BOOKS:

1. Arya, S. D, O'Neil, M. and Pincus, G., *Design of Structures and Foundations for Vibrating Machines,* G.Gulf Publishing Co., 1979.
2. Prakash, S., *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.

IV B.Tech I Semester

(16BT70117) WATERSHED MANAGEMENT

(Program Elective – 3)

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

PREREQUISITES: Courses on Surveying, Engineering Hydrology.

COURSE DESCRIPTION: Concept of watershed; Need and objectives; Characteristics of watershed; Principles of erosion; Measures to control erosion; Water harvesting; Land and ecosystem management; Planning and administration.

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

CO1. Understand the principles and applications of watershed management.
CO2. Assess water availability, soil erosion, ecosystems and watershed management techniques.
CO3. Design solutions for complex harvesting sites to meet the specific needs.
CO4. Conduct investigations and interpret data for development of watersheds.
CO5. Use of modern tools to enhance the efficiency of harvesting systems.
CO6. Consider societal issues in the development of watershed management.
CO7. Ensure environmental sustainability in the development of watershed.
CO8. Effective management of watersheds.

DETAILED SYLLABUS:

UNIT – I: WATERSHED (09 Periods)

Objectives, Need for watershed development in India, Classification, Integrated and multidisciplinary approach for watershed management, Characteristics of watershed – Socio–economic characteristics, Basic data on watersheds.

UNIT – II: PRINCIPLES OF EROSION (10 Periods)

Types of erosion, Factors affecting erosion, Effects of erosion on land fertility, Estimation of soil loss due to erosion, Universal soil loss equation,

Contour techniques, Ploughing, Furrowing, Trenching, Bunding, Terracing, Gully control, Rockfill dam, Brushwood dam, Gabion.

UNIT – III: WATER HARVESTING AND LAND MANAGEMENT (09 Periods)

Rainwater harvesting, Catchment harvesting, Harvesting structures, Soil moisture conservation, Check dams, Artificial recharge - Farm ponds, Percolation tanks, Latest techniques of harvesting; Land use and land capability classification; Management of forest, agricultural, grassland and wild land; Reclamation of saline and alkaline soils.

UNIT – IV: ECOSYSTEM MANAGEMENT (09 Periods)

Role of ecosystem, Crop husbandry, Soil enrichment; Inter, mixed and strip cropping; Cropping pattern, Sustainable agriculture, Bio–mass management, Dry land agriculture, Silvi pastures, Horticulture, Social forestry and afforestation.

UNIT – V: PLANNING AND ADMINISTRATION (08 Periods)

Planning of watershed management activities, Stake holder's participation, Preparation of action plan, Administrative requirements, Trends in watershed management.

Total Periods: 45

TEXT BOOKS:

1. J. V. S. Murthy, *Watershed Management,* New Age International Publishers, 2nd Edition, 2009.
2. R. A. Wurbs and W.P. James, *Water Resource Engineering*, PHI Publications, 2001.

REFERENCE BOOKS:

1. V. V. N. Murthy*, La*nd *a*nd *Water Management,* Kalyani Publications, 4th Edition, 2008.
2. D. K. Majumdar, *Irrigation a*nd *Water Management,* PHI, 2010.
3. Vijay P. Singh, Ram Narayan yadava, *Watershed Management*, Allied Publishers, 2003.
4. Timothy O. Randhir, *Watershed Management: Issues a*nd *Approaches*, IWA Publishing, 2007.

IV B.Tech. - I Semester

(16BT70118) AIR POLLUTION AND CONTROL

(Program Elective - 4)

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

PRE-REQUISITES: Course on Environmental Studies

COURSE DESCRIPTION: Fundamentals of air pollution; Effects of air pollution; Sampling and analysis; Control methods and equipment; Air and noise pollution from industrial operations.

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

CO1. Demonstrate the knowledge on air pollution, effects, sampling, control methods and equipment.
CO2. Identify and analyse air pollution and control measures.
CO3. Design various air pollution controlling systems.
CO4. Provide solutions to complex air pollution problems through proper investigations and interpretation.
CO5. Use appropriate techniques in the analysis, control and management of air pollution.
CO6. Consider the ill effects of air pollution on human health, materials and vegetation in designing controlling systems.
CO7. Understand and demonstrate the need for sustainable development.
CO8. Follow IS codes in analysis and control of air pollution.

DETAILED SYLLABUS:

UNIT – I: AIR 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 behaviour, Wind rose; Dispersion theories and model, Stack height.

UNIT – II: EFFECTS OF AIR 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.

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 effluents.

UNIT – IV: CONTROL METHODS AND EQUIPMENT (10 Periods)

Analytical methods – Chemical, Instrumental and biological methods; Types of collection equipment – Settling chambers, Inertial separators, Cyclones, Filters and electrostatic precipitators, Scrubbers or wet collectors; Choice of equipment and economical aspects, Control of smoke, Gaseous contaminants, Odours and by process changes.

UNIT – V: AIR AND NOISE POLLUTION FROM INDUSTRIAL OPERATIONS (09 Periods)

Air Pollution from Industrial Operations: Air pollution from major industrial operations – Mineral product industries, Cement industry, Petroleum refineries, Ferrous and non-ferrous metallurgical operations, Thermal power plants; Kinds of air quality standards, Emission standards and air pollution indices.

Noise Pollution from Industrial Operations: Noise pollution from industrial operations, Noise standards.

Total Periods: 45

TEXT BOOKS:

1. M. N. Rao and H. V. N. Rao, *Air Pollution*, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 19th Edition, 2010.
2. Thod Godish, *Air Quality*, Levis Publishers, Taylor and Francis Group, New Delhi, 4th Edition, 2003.
3. K. Wark and C. F. Warner, Harper and Row, *Air Pollution: Its Origin and Control*, Addison–Wesley, New York, 3rd Edition, 1998.

REFERENCE BOOKS:

1. R. K. Trivedy and P. K. Goel, *An introduction to Air Pollution*, B. S. P. Books Pvt. Ltd., Hyderabad, 2nd Edition, 2005.
2. K. V. S. G. Murali Krishna, *Air Pollution and Control*, Kousal and Co. Publications, New Delhi, 3rd Edition, 2008.
3. B. Padmanabha Murthy, *Environmental Meteorology*, I. K. Internationals Pvt. Ltd., New Delhi, 2009.
4. Crawford, M., *Air pollution Control Theory*, Tata McGraw-Hill, New Delhi, 1980.
5. H. C. Perkins, *Air Pollution*, McGraw-Hill Higher Education, Lincoln, United Kingdom, 1974.

IV B.Tech. – I Semester

(16BT70119) BRIDGE ENGINEERING

(Program Elective – 4)

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

PRE-REQUISITES: Courses on Reinforced Concrete Structures and Foundation Engineering.

COURSE DESCRIPTION: Bridge loading standards; Box culvert and deck slab bridge; Beam and slab bridge; Bridge bearings; Piers and abutments.

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

CO1. Acquire knowledge on site selection and design of RCC Bridges.
CO2. Analyze various components RCC bridges.
CO3. Design various components of RCC bridges.
CO4. Recommend suitable bridge components.
CO5. Use appropriate techniques in the analysis and design of RCC bridges.
CO6. Consider stability, safety and serviceability requirements in the design components of RCC bridges.
CO7. Ensure environmental sustainability in planning and preparing RCC bridge designs.
CO8. Ensure ethics in RCC bridge design in accordance with IS Codes.

DETAILED SYLLABUS:

UNIT – I: BRIDGE LOADING STANDARDS (08 Periods)

Highway bridge loading standards, Impact factor, Railway bridge loading standards (B.G. ML Bridge), Various loads in bridges, Importance of site investigation in bridge design.

UNIT – II: BOX CULVERT AND DECK SLAB BRIDGE (10 Periods)

Box Culvert: General aspects, Design loads, Design of box culvert subjected to class AA tracked vehicle only.

Deck Slab Bridge: Effective width method of analysis and design of deck slab bridge (simply supported) 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 (08 Periods)

General features, Types of bearings, Design principles of steel rocker and roller bearings, Design of a steel rocker bearing, Design of elastomeric pad bearing.

UNIT – V: PIERS AND ABUTMENTS (10 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

TEXT BOOKS:

1. N. Krishna Raju, *Design of Bridges,* Oxford and IBH, Publishing Company Pvt. Ltd., 4th Edition, 2010.
2. T. R. Jagadish and M. A. Jayaram, *Design of Bridges Structures,* Prentice Hall of India Pvt. Ltd., 2nd Edition, 2004.

REFERENCE BOOKS:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Design of Steel Structures,* Laxmi Publications, 2nd Edition, 2013.
2. Ramachandra, *Design of Steel Structures,* Scientific Publishers (India), 11th Edition, 2009.
3. Ponnuswamy, S., *Bridge Engineering,* Tata Mcgraw–Hill Company, 2nd Edition, 2010.
4. Swami Saran, *Analysis and Design of Substructures – Limit State Design,* Oxford and IBH Publishing Company Pvt. Ltd., 2nd Edition, 2010.

CODES:

1. IRC: 5-2000: Standard Specifications and Code of Practice for Road Bridges Section I: General Features of Design,
2. IRC: 6-2014: Standard Specifications and Code of Practice for Road Bridges Section II: Loads and Stresses,
3. IRC: 21-2000: Standard Specifications and Code of Practice for Road Bridges Section III: Cement Concrete (Plain and Reinforced),
4. IRC: 83 (Part I)-1999: Standard Specifications and Code of Practice for Road Bridges Part I: Metallic Bearings,
5. IRC: 83 (Part II)-1987: Standard Specifications and Code of Practice for Road Bridges Part II: Elastomeric Bearings,

IRC: 83 (Part III)-2002: Standard Specifications and Code of practice for Road bridges Part III: POT, POT–CUM–PTFE, PIN AND METALLIC GUIDE BEARINGS, **are to be permitted into the examination hall.**

IV B.Tech. – I Semester

(16BT70120) GROUND IMPROVEMENT TECHNIQUES

(Program Elective – 4)

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

PREREQUISITES: Courses on Soil Mechanics and Foundation Engineering.

COURSE DESCRIPTION: Scope of ground improvement; Methods of ground improvement; Drainage and dewatering; In–situ densification; Stabilization; Geosynthetics and earth reinforcement.

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

CO1. Explain the concept and techniques of ground improvement.
CO2. Compare different types of ground improvement techniques and select an appropriate one.
CO3. Design ground improvement techniques.
CO4. Solve complex soil problems through suitable ground improvement techniques.
CO5. Use and develop appropriate ground improvement techniques.
CO6. Understand the importance of safety in the design and execution of any ground improvement technique.
CO7. Recommend environmental friendly ground improvement techniques.
CO8. Follow IS Codes in practicing ground improvement techniques.

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.

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 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.

Total Periods: 45

TEXT BOOKS:

1. Hausmann, M. R., *Engineering Principles of Ground Modification,* McGraw–Hill Publishers, 1990.
2. Purushotham Raj, P., *Ground Improvement Techniques,* Laxmi Publications Pvt. Ltd., 2005.

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.

IV B.Tech. – I Semester
(16BT70121) HYDRO POWER ENGINEERING

(Program Elective – 4)

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

PRE-REQUISITES: Course on Fluid Mechanics and Hydraulic Machinery.
COURSE DESCRIPTION: Hydro power; Water power estimate; Hydro power plants; Pumped storage power plants; Hydraulic turbines; Water conveyance; Channel surges and intakes; Power house and equipment.

COURSE OUTCOMES: On successful completion of this course, the students will able to:

CO1. Demonstrate knowledge on the basic concepts of hydro power, hydro power plants and its components.
CO2. Analyze hydro power estimates, hydro power plants and its components.
CO3. Design components of hydro power plant.
CO4. Recommend suitable solutions for hydro power issues through proper investigation and interpretation.
CO5. Use appropriate methods in estimation of hydropower potential.
CO6. Consider societal issues while recommending for the construction of hydro power plants.
CO7. Ensure environmental sustainability in planning, construction and operation of hydro power plants.

DETAILED SYLLABUS:

UNIT - I: HYDROPOWER AND ESTIMATE (09 Periods)

Hydropower development, Sources of energy, Estimation of water power potential, Load curve, Load factor, Capacity factor, Utilization factor, Diversity factor, Load duration curve, Firm power, Secondary power, Prediction of load, Collection and analysis of stream flow data, Mass curve, Flow duration curves, Construction and utility of these curves, Effect of storage and pondage, Estimates of available water power.

UNIT - II: HYDROPOWER PLANTS (09 Periods)

Low and high head plants: Classification of hydel plants, Run-off- river plants, General arrangement of run-off-river plants, Valley dam plants, Diversion canal plants, High head diversion plants, Storage and pondage, Basic features, Advantages of pumped storage plants, Types of pumped storage plants, Relative merits of two-unit and three-unit arrangement, Tidal power plants.

UNIT - III: HYDRAULIC MACHINES (10 Periods)

Reciprocating Pumps, Components and working principle of Single acting and double acting reciprocating pumps, Discharge coefficient, Volumetric efficiency and Slip; Work done by reciprocating pumps, Work done and power input, Indicator diagram, Effect of acceleration and friction on indicator diagram.

UNIT - IV: WATER CONVEYANCE (09 Periods)

Classification of penstocks, Design criteria, Economical diameter, Anchor blocks, Conduit valves, Bends and manifolds -Water hammer, Resonance in penstocks, Channel surges, Surge tanks, Intakes, Types, Losses, Air entrainment, Inlet aeration, Canals, Forebay, Tunnels, Selection of turbines.

UNIT - V: POWER HOUSE AND EQUIPMENT (08 Periods)

Location of power house, General arrangement of hydroelectric unit, Number and size of units, Power house sub structure.

Total Periods: 45

TEXT BOOKS:

1. M. M. Dandekar and K.N. Sharma, *Water Power Engineering*, Vikas Publishing House Pvt. Ltd., India, 2007
2. R.K. Sharma and T.K. Sharma, *A Text Book of Water Power Engineering*, S. Chand Company, New Delhi, 2008.

REFERENCE BOOKS:

1. B. C. Punmia, B. B. PandeLal, Ashok Kumar Jain and Arun Kumar Jain, *Irrigation and Water Power Engineering*, Laxmi Publications, New Delhi, 2009.
2. P. N. Modi, *Irrigation Water Resources and Water Power Engineering*, Standard Book House, 7th Edition, 2008.
3. K. R. Arora, Irrigation, *Water Power and Water Resources Engineering*, Standard Publishers Distributors, Delhi, 4th Edition, 2011.
4. Deshmukh M.M, *Water Power Engineering*, DhanpatRai and Sons, New Delhi, 1978.

IV B.Tech. – I Semester
(16BT70122) PAVEMENT ANALYSIS AND DESIGN
(Program Elective – 4)

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

PRE-REQUISITES: Course on Highway and Traffic Engineering.

COURSE DESCRIPTION: Highway materials and mix design; Design factors for flexible pavements; Analysis and design of flexible pavements; Analysis and design of rigid pavements.

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

CO1. Demonstrate the knowledge on transportation planning, pavement analysis and design.
CO2. Analyze problems associated with transportation planning, pavement analysis and design.
CO3. Design of pavements and bituminous concrete mix.
CO4. Solve transportation planning, pavement analysis and design problems through proper analysis, interpretation and design.
CO5. Use appropriate methods in transportation planning, pavement analysis and design.
CO6. Consider safety issues in providing solutions to problems in transportation planning and pavement design.
CO7. Provide solutions to the problems in transportation planning, pavement analysis and design, considering environment.
CO8. Follow codes of practice in transportation planning, pavement analysis and design.

DETAILED SYLLABUS:

UNIT - I: HIGHWAY MATERIALS AND MIX DESIGN (09 Periods)

Soil, Aggregate and bitumen, Aggregate properties and their Importance, Bituminous concrete - Mix design, Marshall's method of bituminous mix design.

UNIT - II: DESIGN FACTORS AND ANALYSIS OF FLEXIBLE PAVEMENTS (12 Periods)

Design Factors for Flexible Pavements: Types of pavement, Factors affecting design of flexible pavements - Elastic modulus, Poisson's ratio, Wheel load, Wheel configuration and tyre pressure, ESWL Concept, Contact pressure, Material characteristics, Environmental and other factors.

Analysis of Flexible Pavements: Stresses in flexible pavement, Layered systems concept - One layer system, Boussinesq two-layer system, Burmister two-layer theory for pavement design.

UNIT - III: DESIGN OF FLEXIBLE PAVEMENTS (08 Periods)

Theoretical, Empirical and semi-empirical methods - Burmister, CBR Method, AASHO Method, IRC method.

UNIT - IV: ANALYSIS OF RIGID PAVEMENTS (08 Periods)

Stresses in rigid pavements, Relative stiffness of slab, Modulus of sub grade reaction, Stresses due to warping, Stresses due to loads, Stresses due to friction.

UNIT - IV: DESIGN OF RIGID PAVEMENTS (08 Periods)

General design approach, PCA method, AASHTO, IRC method, Design of different types of joints in CC pavements, Design of tie bars and dowel bars.

Total Periods: 45

TEXT BOOKS:

1. Khanna, S. K., Justo, C. E. G. and Veeraragavan, A., *Highway Engineering, Nem* Chand & Bros, Roorkee, Revised 10th Edition, 2014.
2. Kadiyali, L. R., *Traffic Engineering and Transport Planning,* Khanna Technical Publications, 7th Edition, 2010.

REFERENCE BOOKS:

1. Jotin Khisty, C. and Kent Lall, B., *Transportation Engineering – An Introduction,* Prentice Hall of India Pvt. Ltd., 3rd Edition, 2006.
2. Partha Chakroborthy and Animesh Das, *Principles of Transportation Engineering,* Prentice Hall of India Pvt. Ltd, 2005.
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., 2006.
5. Mannering, F. L. and Washburn, S. S., *Principles of Highway Engineering and Traffic Analysis*, John Wiley & Sons, Inc., 5th Edition, 2013.

CODES:

1. IRC: 37-2012: *Tentative Guidelines for the Design of Flexible Pavements,* Third Revision, Indian Roads Congress, New Delhi,
2. IRC: 58-2015: *Guidelines for the Design of Plain Jointed Rigid Pavements for Highways*, Fourth Revision, Indian Roads Congress, New Delhi, **are to be permitted into the examination hall.**

IV B.Tech. – I Semester

(16BT70123) **PRESTRESSED CONCRETE**

(Program Elective –4)

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

PRE-REQUISITES: Courses on Structural Analysis, 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: On successful completion of this course, the students will be able to:

CO1. Demonstrate the knowledge on prestressed concrete structures and composite construction.
CO2. Analyze prestressed concrete members and composite structures.
CO3. Design prestressed concrete structural elements and composite structures.
CO4. Solve problems associated with prestressed concrete structures and composite construction through proper analysis and interpretation.
CO5. Use appropriate techniques for the analysis and design of prestressed concrete structures and composite construction.
CO6. Consider safety issues in the design of prestressed concrete structures and composite construction in the context of society.
CO7. Follow IS Codes of practice in the design of prestressed concrete structures and composite construction.

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, Pre-tensioning 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

TEXT BOOKS:

1. N. Krishna Raju, *Prestressed Concrete*, Tata McGraw–Hill Publications, 4th Edition, 2011.
2. N. Rajagopalan, *Prestressed Concrete*, Narosa Publications, 2nd Edition, 2014.

REFERENCE BOOKS:

1. Ramamrutham, *Prestressed Concrete*, Dhanpat Rai Publications, 5th Edition, 2003.
2. T. Y. Lin 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. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Reinforced Concrete Structures*, Vol. I, Laxmi Publications Pvt. Ltd., New Delhi, 19th Edition, 2010.

CODE:

IS: 1343–2012: Prestressed Concrete – Code of Practice, **is to be permitted into the examination hall.**

IV B.Tech. – I Semester
(16BT70124) REHABILITATION AND RETROFITTING OF STRUCTURES
(Program Elective –4)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	1	0	3

PRE-REQUISITES: Courses on Building Materials and Construction Technology, Concrete Technology, 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: On successful completion of this course, the students will be able to:

CO1. Demonstrate the knowledge on maintenance, repair and rehabilitation of concrete structures.
CO2. Analyze structural damages and techniques of rehabilitation, retrofitting and demolition.
CO3. Solve the complex problems pertaining to the repairs, rehabilitation, retrofitting and demolition of structures.
CO4. Use appropriate techniques for repairs, rehabilitation, retrofitting and demolition of structures.
CO5. Understanding the impacts of damages and apply contextual knowledge in repair, rehabilitation, retrofitting to ensure safety of the structures in societal context.
CO6. Comprehend the reports effectively on the case studies of demolition of buildings.

DETAILED SYLLABUS:

UNIT - I: MAINTENANCE AND REPAIR STRATEGIES (08 Periods)

Maintenance, Repair and rehabilitation, Facets of Maintenance, Importance of maintenance, Various aspects of inspection, Assessment procedure for evaluating a damaged structure, Causes of deterioration.

UNIT - II: 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 accelerated strength gain, Expansive cement, Polymer concrete, Sulphur infiltrated concrete, Ferrocement, Fibre reinforced concrete, Rust eliminators and polymers coating for rebars during repair, Foamed concrete, Mortar and dry pack, Vacuum concrete.

UNIT - IV: TECHNIQUES FOR REPAIR (09 Periods)

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.

UNIT - V: REPAIRS, REHABILITATION, RETROFITTING AND DEMOLITION OF STRUCTURES (09 Periods)

Repairs, Rehabilitation, Retrofitting of Structures: Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, Weathering, Corrosion, Wear, Fire, Leakage and marine exposure.

Demolition of Structures: Engineered demolition techniques for dilapidated structures – Case studies.

Total Periods: 45

TEXT BOOKS:

1. Vidivelli, B., *Rehabilitation of Concrete Structures*, Standard Publishers Distributors, 2008.
2. Santhakumar, A. R., *Training Course Notes on Damage Assessment and Repairs in Low Cost Housing*, "RHDC – NBO", Anna University, 1992.

REFERENCE BOOKS:

1. Shetty, M. S., *Concrete Technology – Theory and Practice,* S. Chand and Company, 2005.
2. Zongjinli, *Advanced Concrete technology*, John Wiley and Sons, 2011.
3. M. G. Alexander, H. D. Beushausen, F. Dehn and P. Moyo, *Concrete Repair, Rehabilitation and Retrofitting III*, CRC press/ Balkama, 2012.
4. P. K. Guha, *Maintenance and Repairs of Buildings*, New Central Book Agency (P) Ltd., 2006.

IV B.Tech. – I Semester
(16BT70131) CIVIL ENGINEERING SOFTWARE LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

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

CO1. Acquire knowledge on software tools in analysis and design of civil engineering systems.
CO2. Analyse civil engineering systems by software tools.
CO3. Design civil engineering systems through software tools.
CO4. Address complex civil engineering problems for better solutions with software tools.
CO5. Use the latest software tools for modeling, analysis and design of civil engineering systems.
CO6. Consider safety of built environment through software tools.
CO7. Contemplate environmental sustainability of civil engineering systems through software tools.
CO8. Follow ethics in civil engineering practice through software tools.
CO9. Function effectively as an individual and as a team member in modeling, analysis and design of civil engineering systems using software tools.
CO10. Communicate effectively on civil engineering software applications in written, oral and graphical forms.

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** for Structural 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** for Geotechnical Modeling Software
8. **Civil 3D** for Computer Aided Civil Engineering Drafting
9. **MXROAD SUITE** for Pavement Design, Rehabilitation and Renewal.
10. **KENPAVE** for Pavement Design and Rate Analysis of Roads
11. **SYNCHRO** for Traffic 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** for Project 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

Suggested References:

- Software manuals

Note: A minimum of twelve exercises are to be performed covering all technical areas of civil engineering

IV B. Tech. – I Semester

(16BT70132) REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEMS LAB

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
50	50	100	-	-	3	2

PRE-REQUISITES: -

COURSE DESCRIPTION: Creation of geo–database; Digitization of toposheet/map; Drainage analysis; Developing digital elevation model; Preparation of thematic maps; Land use and land cover analysis; Study of feature estimation; Rainfall runoff analysis; Road network analysis; Watershed analysis; Site suitability analysis; Natural hazard zones map.

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

CO1. Demonstrate the practical knowledge on toposheets, aerial photographs, satellite imagery, remote sensing and GIS applications to civil engineering.
CO2. Identify the spatial objects on the toposheets and imagery.
CO3. Create the thematic maps using geospatial data with emphasis on practical applications in civil engineering.
CO4. Conduct field study and interpret the spatial and non spatial data.
CO5. Select appropriate methods to estimate the feature classes in RS and GIS applications.
CO6. Provide geospatial solutions to civil engineering problems considering societal issues.
CO7. Consider environmental sustainability in engineering and non engineering applications.
CO8. Follow standards in mapping and interpretation of the geospatial data.
CO9. Function effectively as an individual, and as a member or leader in teams to solve Geospatial technology issues.
CO10. Communicate effectively on the geospatial data to the engineering community and society in written, oral and graphical forms.

DETAILED SYLLABUS:

LIST OF EXERCISES:

1. Creation of geo–database
2. Digitization of toposheet/map
3. Drainage analysis
4. Developing digital elevation model
5. Preparation of thematic maps
6. Landuse and landcover analysis
7. Study of feature estimation
8. Rainfall–runoff analysis
9. Road network analysis
10. Watershed analysis
11. Site suitability analysis
12. Natural hazard zones map

IV B.Tech. – I Semester
(16BT70133) **COMPREHENSIVE ASSESSMENT**

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

PRE-REQUISITES: All the courses of the program.

COURSE DESCRIPTION: Assessment of student learning outcomes in the courses of the program.

COURSE OUTCOMES: Comprehensive Assessment enables a successful student to demonstrate:

CO1. Knowledge in the courses of the program.
CO2. Analytical ability in the courses of the program.
CO3. Design skills in the courses of the program.
CO4. Ability to investigate and solve complex engineering problems in the courses of the program.
CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the courses of the program.
CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the courses of the program.
CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development in the courses of the program.
CO8. Ability to apply ethics and norms of the engineering practice in the courses of the program.
CO9. Ability to function effectively as an individual in the courses of the program.
CO10. Ability to present views cogently and precisely in the courses of the program.
CO11. Project management skills in the courses of the program.
CO12. Ability to engage in life-long leaning in the courses of the program.

IV B.Tech. – II Semester

(16BT80131) **PROJECT WORK**

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
100	100	200	-	-	-	12

PRE-REQUISITES: All the courses of the program.

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: Completion of the project work enables a successful student to demonstrate:

CO1. Knowledge on the project topic.
CO2. Analytical ability exercised in the project work.
CO3. Design skills applied on the project topic.
CO4. Ability to investigate and solve complex engineering problems faced during the project work.
CO5. Ability to apply tools and techniques to complex engineering activities with an understanding of limitations in the project work.
CO6. Ability to provide solutions as per societal needs with consideration to health, safety, legal and cultural issues in the project work.
CO7. Understanding of the impact of the professional engineering solutions in environmental context and need for sustainable development experienced during the project work.
CO8. Ability to apply ethics and norms of the engineering practice as applied in the project work.
CO9. Ability to function effectively as an individual as experienced during the project work.
CO10. Ability to present views cogently and precisely on the project work.
CO11. Project management skills as applied in the project work.
CO12. Ability to engage in life-long leaning as experience during the project work.

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(AUTONOMOUS)

Sree Sainath Nagar, A.Rangampet, Near Tirupati - 517 102. A.P.

Salient Features of Prohibition of Ragging in Educational Institutions Act 26 of 1997

- Ragging within or outside the College is prohibited.
- Ragging means doing an act which causes or is likely to cause insult or annoyance or fear or apprehension or threat or intimidation or outrage of modesty or injury to a student

Nature of Ragging	Punishment
Teasing, Embarrassing and humiliating	Imprisonment up to 6 months or fine up to Rs. 1,000/- or Both
Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 year or fine up to Rs. 2,000/- or Both
Wrongfully restraining or confining or causing hurt	Imprisonment up to 2 years or fine up to Rs. 5,000/- or Both
Causing grievous hurt, Kidnapping or rape or committing unnatural offence	Imprisonment up to 5 years or fine up to Rs. 10,000/-
Causing death or abetting suicide	Imprisonment up to 10 years or fine up to Rs. 50,000/-

Note:

1. A student convicted of any of the above offences, will be expelled from the College.
2. A student imprisoned for more than six months for any of the above offences will not be admitted in any other College.
3. A student against whom there is prima facie evidence of ragging in any form will be suspended from the College immediately.
4. The full text of Act 26 of 1997 **and** UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009 **(Dated 17th June, 2009) are placed in the College library for reference.**