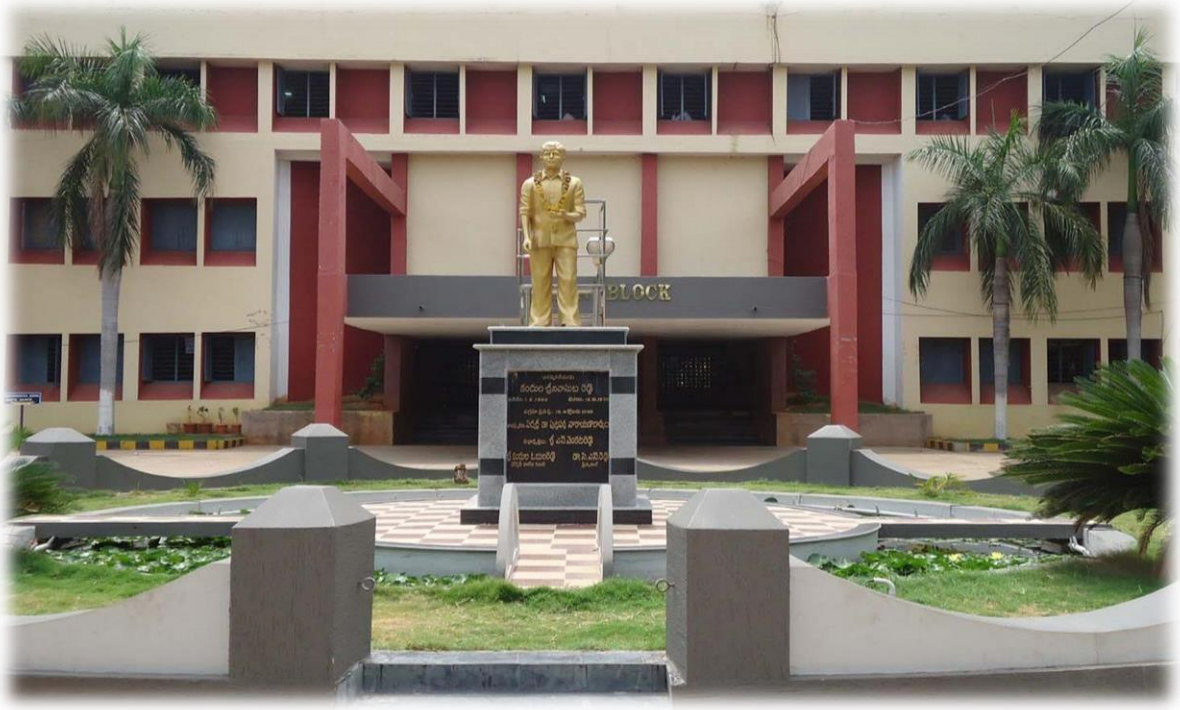
Regulations for UG Program in Engineering (R18 UG)

(Effective from 2018-19 for regular students and 2019-20 for lateral entry students)

B. Tech VII & VIII Semester (R18) Syllabus
Civil Engineering



Kandula Srinivasa Reddy Memorial College of Engineering (Autonomous)

Kadapa-516005. AP
(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)
(An ISO 9001-2008 Certified Institution)

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ABOUT THE DEPARTMENT

Civil Engineering Department of KSRM College of Engineering is one of the five founding departments. The motto of the department is EXCEED (Excellence in Civil Engineering Education). The department provided its valuable consultancy services to Roads and Buildings (R & B) Department of Kadapa to improve Guvvalacheruvu Ghat section to enhance safety, comfort, reduce road accidents and travel time between Kadapa and Rayachoty. The civil engineering department is recognized as research center by JNTUA, Ananthapuramu. AICTE sponsored 13.55 Lakhs under MODROBS scheme to modernize and equip with latest digital equipment in Geotechnical Engineering Lab. The department conceived, planned, designed, developed, and implemented the KSRM Library Information Project (KLIP).

VISION

To produce high competent ethical Civil Engineering professionals with globally perspectives for catering to local, national and global needs and evolving the department to provide state-of-the-art consultancy, research & development in the field of Civil Engineering and its allied areas.

MISSION

M1: To produce high caliber Civil Engineers by providing rigorous hands-on education with innovative and original thinking in the minds of budding engineers to face the challenges of future.

M2: With continuous interaction of industries, research organizations and eminent professionals enriching the curriculum and setting the department as center of excellence for academics, consultancies and research in the field of Civil Engineering and allied areas.

M3: By inculcating the field activities, certificate programs, professional and ethical values to our students in order to make them prepare to face the competitive world.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1 - Technical & Employability Skills: To enable the students for acquiring the required skills by successful completion of an advanced degree, professional development with industrial training course(s) in order the meet the industrial needs and embed the knowledge to adopt the futuristic transformation in technology.

PEO2 - Problem solving, Self-learning & Leadership: By utilizing the new technologies and tools to enhance the technical knowledge for advance professionalism to develop an ability for solving complex technical problems. Encouraging for publishing papers or delivering effective conference presentations for acquiring knowledge and instilling confidence to become a successful professional/entrepreneur.

PEO3 - Professional Ethics: To prepare students work in multidisciplinary teams on problems whose solutions lead to significant societal benefit.

PROGRAMME OUTCOMES

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

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

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

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

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

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

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

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. An understanding of professional and ethical responsibility and norms of electrical engineering practices.

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

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

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

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

PROGRAMME SPECIFIC OUTCOMES

The graduates in Civil Engineering will be able to

PSO 1: Analyze, Design, Construct, Maintain and Operate infrastructural projects.

PSO 2: Assess the environmental impact of various projects and take required measures to curb environmental deterioration.

PSO 3: Use latest software pertaining to various streams of Civil Engineering.

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KSRM College of Engineering (Autonomous), Kadapa-516003, AP

Regulations for UG Programs in Engineering (R18 UG)
(Effective from 2018-19)

1.0 Nomenclature

1.1 *Academic Year*: Period of academic instruction of, approximately, one year duration that usually starts in June/July and ends in April/May next
1.2 *Semester*: Either of two divisions of an academic year
1.3 *Major*: A specific field of study. Example: Civil Engineering
1.4 *Minor*: An area outside of, or complementary to, a Major. Example: For Civil Engineering major, Computer Science is a minor and vice versa
1.5 *Subject*: An area of knowledge that is studied as part of a Course
1.6 *Core*: A subject that is mandatory for a Major course of study
1.7 *Elective*: A subject that is selected for study to suit one's individual needs
1.8 *Mandatory Subject*: A subject that is studied to meet certain requirements but has no credits assigned to it
1.9 *Humanities subjects*: Subjects that describe and interpret human achievements, problems and historical changes at individual and societal levels covering the disciplines of literature, history, and philosophy
1.10 *Social Sciences*: Subjects that describe the mental and behavioural activities of individuals, groups, organizations, institutions, and nations covering the disciplines of anthropology, economics, linguistics, political science, and psychology
1.11 *Exam*: A test to measure one's progress, knowledge, or ability in a subject
1.12 *Credit*: A numerical weight given to a subject, usually based on quantum of academic work
1.13 *Grade*: A numerical or alphabetic designation measuring the level of achievement in an exam
1.14 *Attendance*: Physical presence of oneself in a classroom/laboratory for purpose of a scheduled academic instruction
1.15 *Course*: A series of subjects that constitute a Major field of study
1.16 *Branch*: Same as Course
1.17 *Program*: Same as Course
1.18 *Degree*: An academic title conferred to honour distinguished achievement
1.19 *Minor Degree*: An Academic honour conferred on achieving 20 extra credits in one's minor area of study
1.20 *Honours*: An Academic honour conferred on achieving 20 extra credits in one's major area of study

2.0 Short Title and Application

2.1 These rules and regulations may be called as R18UG and come into force from Academic Year 2018-19 and exist until superseded by new regulations. These rules are applicable for students who join the institute from academic year 2018-19 onwards. Students who have joined in earlier regulations will continue in their respective regulations
2.2 These rules and regulations are applicable to all undergraduate courses in engineering and technology leading to Bachelor's Degree in Technology (B. Tech)
2.3 The Major courses offered, at present, are:
    2.3.1 Civil Engineering
    2.3.2 Electrical and Electronics Engineering
    2.3.3 Mechanical Engineering

2.3.4 Electronics and Communications Engineering
2.3.5 Computer Science and Engineering

2.4 The Institute may offer new Majors in future to which these rules and regulations will be applicable

3.0 Suspension and Amendment of Rules

3.1 Academic Council has the authority to suspend a rule temporarily

3.2 Academic Council has the authority to amend a rule

3.3 For affirmative action on any suspension or amendment of a rule, an affirmative vote of three-fifths of the members present and voting shall be required in Academic Council

4.0 Requirements for Admission

4.1 At present, admissions into first-year class of various Majors are governed by Government and the Affiliating University. The eligibility criteria and procedure for admission are prescribed by Government and Affiliating University

4.2 A student is not allowed change of Major after admission into first year

4.3 A student must fulfil medical standards required for admission

4.4 The selected students are admitted into first-year class after payment of the prescribed fees

5.0 Structure of the B. Tech course

5.1 *Duration*: The duration of B. Tech degree course is eight semesters spread over four academic years. Semesters are named sequentially from First Semester to Eighth Semester

5.2 *Working Days*: Calendar for any semester shall be announced at least four weeks before its commencement. Minimum number of working days shall be 90 for any semester

5.3 *Curriculum*: Each major shall have core, elective and mandatory subjects drawn from six categories of subject areas -i) Basic Sciences (BSC), ii) Humanities and Social Sciences including Management Courses (HSMC), iii) Engineering Science Courses (ESC), iv) Professional Core Course (PCC), v) Professional Elective Course (PEC), and vi) Open Elective Course (OEC). The curriculum for each branch shall be approved by its corresponding Board of Studies and Academic Council

5.4 *Credits*: All subjects that are assessed for marks have credits assigned to them. The credits assigned to subjects shall be given in curriculum. The total number of credits for entire course is 160 for all branches.

5.5 *Curriculum and Syllabus*: The curriculum and syllabus for first and second semesters is given in Annexure-1 and Annexure-2 respectively

5.6 *Medium of Instruction*: The medium of instruction, examinations and all other related activities is English

5.7 *Responsibility and Advising*: It is the responsibility of the student to understand and know the regulations and requirements to earn the degree. Each student admitted into the degree programs is assigned to a Faculty Advisor who assists the student in designing an effective program of study. Students should consult their Faculty Advisors for selection of electives and for general advice on academic program

6.0 Registration and Enrolment

6.1 Prior to start of each semester, every student shall register for all the subjects listed in curriculum and additional subjects required for achieving honours/ minor degree. Excepting first semester, the registration for a semester shall be done during a specified week after end examinations of previous semester. In first semester, the registration

shall be done within six working days from date of joining. Recommendation of Faculty Advisor is needed for registration.

6.2 A student can register utmost 8 theory subjects, including mandatory subjects, in any semester.

6.3 Late registration will be permitted with a fine, decided from time to time, up to six working days from the last date specified for registration

6.4 A student will be eligible for registration for a semester if she or he) is promoted to that semester, ii) has cleared all fees to the Institute, library and hostel of previous semester, and iii) is not disqualified for registration by a disciplinary action of the Institute

6.5 A student will be enrolled and allowed to attend the classes on successful registration and payment of necessary fees to Institution, library, and hostel

6.6 Registration and enrolment will be controlled by the Office of the Controller of Examinations

7.0 Assessment Procedure – Internal Tests and End Examinations

7.1 Performance of students in all subjects is assessed continuously through assignments, internal assessment tests and an End examination

7.2 Allocation of internal assessment and End examination marks

7.2.1 For theory subjects, the allocation is 30 marks for internal assessment and 70 marks for End examination totalling 100 marks

7.2.2 For laboratory/drawing/project work subjects, the allocation is 50 marks for internal assessment and 50 marks for End examination totalling 100 marks

7.2.3 For seminar/industrial training/internship subjects, the allocation is 100 marks for internal assessment. There is no end examination for these subjects

7.2.4 For mandatory subjects the allocation is 30 marks for internal assessment and no allocation for End examination. These marks are specified for purpose of clause 9.3, and do not account for any credits

7.3 Internal Assessment

7.3.1 Internal assessment means performance evaluation of students by faculty members who teach the subjects

7.3.2 For each theory subject, including mandatory subjects, the internal assessment shall be done by two midterm tests for 25 marks and assignments for 5 marks. The faculty member of the concerned subject will assess the marks in midterm tests and assignments.

Each midterm test will be of two hours duration and evaluated for 25 marks. Internal assessment marks for midterm tests will be calculated as weighted sum of the two midterm test marks, with 80% weight for the best and 20% weight for the other marks. Internal assessment marks for assignments is calculated as the average of all assignments. Total internal marks is the sum of midterm tests and assignments assessment marks

If any student abstains for any midterm test, she or he will be awarded zero marks for that midterm test. If any student fails to submit any assignment within the specified deadline, she or he will award zero marks for that assignment

The guidelines for internal assessment are given in Annexure 3

7.3.3 For laboratory/practical/drawing subjects, the internal assessment will be based on regular laboratory work over full semester. The assessment will be done by the faculty concerned. The students shall be informed sufficiently early of the procedure to be followed for internal assessment

7.3.4 For subjects like seminar, project-work, industrial training/internship, and comprehensive viva-voce, the internal assessment will be done by a Department Committee consisting of two senior faculty members and faculty guide of

concerned student. The assessment procedure will be informed sufficiently early to the students

7.4 End examinations

7.4.1 End examinations shall be conducted after completion of coursework in each semester

7.4.2 The question papers for theory subjects shall be set by faculty members outside of the Institute. The external faculty members for question paper setting shall be appointed by the Principal

7.4.3 Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the Principal. A minimum of 50% of subjects will be evaluated by external examiners.

7.4.4 For laboratory subjects, end examination shall be conducted by a committee consisting of two internal examiners. One examiner shall be appointed by Head of Department of concerned Major, and the other examiner shall be appointed by the Principal

7.4.5 For project work viva-voce, end examination shall be conducted by a committee consisting of one internal examiner, one external examiner, and the concerned guide of the student. Internal examiner shall be appointed by Head of Department of concerned Major, and the external examiner shall be appointed by the Principal

7.4.6 If a student abstains from End examination of any subject, for any reason, she or he shall be awarded zero marks in that subject

7.4.7 There is no end examination for mandatory subjects

8.0 Method of Assigning Letter Grades and Grade Points

8.1 For all credit-bearing subjects, performance of a student in a subject is indicated by a letter grade that corresponds to absolute marks earned in that subject. Each letter grade is assigned a numeric Grade Point that is used to compute Grade Point Average on a scale of 0 to 10

8.2 Performance of a student in both internal assessment and End examination will be considered for awarding grades for credit bearing subjects. Total marks earned in a subject is the sum of marks obtained in internal assessment and End examination in that subject

8.3 Pass grade A+ to D- is assigned to a subject based on total marks earned in that subject provided that a student earns at least i) 35% of marks in End examination marks and ii) 40% of marks in internal assessment and End examination marks put together; otherwise fail grade F will be assigned to that subject

8.4 Grade I will be assigned to a subject if a disciplinary action is pending and is not resolved before publication of results. Office of Controller of Examinations shall resolve the pending disciplinary action within six working days from the date of publication of results and change the grade to any of A+ to D- or F

8.5 Grade X will be assigned to a subject if a student abstains for End examination of that subject

8.6 The absolute marks and corresponding letter grade and grade points are given in Table 1

Table 1 Letter Grades and Grade Points

Absolute Marks	Letter Grade	Grade Points	Remark
95-100	A+	10.0	Pass
90-94	A	9.5	Pass
85-89	A-	9.0	Pass
80-84	B+	8.5	Pass
75-79	B	8.0	Pass
70-74	B-	7.5	Pass
65-69	C+	7.0	Pass
60-64	C	6.5	Pass
55-59	C-	6.0	Pass
50-54	D+	5.5	Pass
45-49	D	5.0	Pass
40-44	D-	4.5	Pass
0-39	F	0.0	Fail
-	I	0.0	Result Withheld
-	X	0.0	Absent for End Exam

8.7 *SGPA*: Semester Grade Point Average indicates the performance of a student in all credit-bearing subjects of a semester. SGPA is calculated as the weighted average of Grade Points of all subjects of the semester with corresponding credits of subjects as weights.

8.8 *CGPA*: Cumulative Grade Point Average indicates the performance of a student in all semesters up to and including the current semester under consideration. CGPA is calculated as the weighted average of SGPAs with total credits in each semester as the weights.

8.9 In *SGPA / CGPA* calculations credits earned towards honours / minor degree will not be counted.

8.10 *Grade Card*: All students shall be issued Grade Cards after the publication of results of a semester. Grade Card is a statement of performance of a student in a semester. It contains information about each registered subject: type of subject, allocated credits, and letter grade earned. SGPA and CGPA will also be indicated

9.0 Requirements for Completing Subjects

9.1 A student shall complete all credit-bearing and mandatory subjects successfully to be eligible for award of degree

9.2 *Credit-bearing subjects*: A student is considered to have completed a credit-bearing subject successfully and earned credits if she or he obtains a pass grade from A+ to D- in that subject. If a student receives fail grade F or X in any subject, she or he must register for supplementary End examination for that subject as and when opportunity arises and improve grade to pass grade

9.3 *Mandatory subjects*: A student is considered to have successfully completed a mandatory subject if she or he earns at least 40% of internal assessment marks in that subject.
Supplementary exam for mandatory subjects: If a student fails in mandatory subject, she or he shall register for supplementary examination in that subject as and when the opportunity arises and pass that subject. The supplementary exam will be conducted for 30 marks covering the entire syllabus and student is deemed to have passed in the subject if she or he earns 12 marks (40% marks) in the supplementary exam, disregard of her or his performance in assignments and internal tests.

10.0 Requirements for taking End Examinations and Promotion

10.1 A student is eligible to take regular End Examinations of current semester if she or he full fills the attendance requirement

10.2 A student shall be promoted from current semester to succeeding semester on satisfying the attendance and total credits-earned requirements

10.3 Attendance Requirement

10.3.1 Attendance of students shall be recorded for credit-bearing and mandatory subjects as per the workload indicated in curriculum

10.3.2 Total class-periods conducted shall be reckoned from beginning to end of a semester as published in academic calendar

10.3.3 Aggregate Percentage of Attendance is calculated using total number of class-periods attended as numerator and total number of class-periods conducted for the concerned semester as the denominator

10.3.4 A minimum aggregate attendance of 75% is required for promotion to succeeding semester and be eligible to take End examinations of current semester

10.3.5 A student can appeal to the Principal for condoning deficiency in aggregate attendance if she or he gets an aggregate attendance of 65% or more but less than the required 75%, presenting a valid reason for deficiency. Such a student will be granted promotion if the Principal pardons the deficiency. Principal has the right to reject the appeal if he/she is not satisfied with the performance of the student or the reason cited for deficiency of the attendance

10.3.6 A student earning less than 65% aggregate attendance will be denied promotion. A student who is not promoted on basis of attendance shall be removed from the rolls and shall register for the same semester when opportunity arises. The current semester record of the student is cancelled automatically

10.4 Credits-Earned Requirement

10.4.1 This rule is applicable for promotion of a student from fourth semester to fifth semester, and from sixth semester to seventh semester

10.4.2 A student who is denied promotion for want of requisite credits shall take supplementary examinations, as and when offered, and earn credits to be eligible for promotion.

10.4.3 Subjects registered for honours/minor degree shall not be considered towards credits-earned requirement.

10.4.4 For promotion from fourth semester to fifth semester, a student must earn at least 40% credits (rounded to lower integer) from first semester to third semester subjects. A student will get the following opportunities to pass the subjects:
First semester subjects: One regular and three supplementary exams
Second semester subjects: One regular and two supplementary exams
Third semester subjects: One regular and one supplementary exam

10.4.5 For promotion from sixth semester to seventh semester, a student must earn at least 40% credits (rounded to lower integer) from first semester to fifth semester subjects. A student will get the following opportunities to pass the subjects:
First semester subjects: One regular and five supplementary exams
Second semester subjects: One regular and four supplementary exams
Third semester subjects: One regular and three supplementary exams
Fourth semester subjects: One regular and two supplementary exams
Fifth semester subjects: One regular and one supplementary exam

11.0 Revaluation of End Examination Scripts

11.1 Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee

11.2 Procedure for Revaluation: The script will be revaluated by an examiner appointed by the Principal. The maximum of revaluation and regular end examination marks will be awarded for that subject

11.3 A student can apply for revaluation in a subject only once

12.0 Supplementary End Examinations

12.1 Students are eligible to take Supplementary examinations in subjects with fail grade either F or X only

12.2 Supplementary examinations for even semester subjects will be conducted along with regular examinations of odd semester subjects

12.3 Supplementary examinations for odd semester subjects will be conducted along with regular examinations of even semester subjects

12.4 For eighth semester, special supplementary examinations will be conducted in second week following the results publication date of regular examination of eighth semester

12.5 A student will be allowed to improve grade in any theory subject provided she or he has completed coursework of all semesters but before award of provisional/final degree

13.0 Requirements for Award of B. Tech degree

13.1 Time Limit for completion of requirements for award of degree is eight academic years from the date of admission. A student who could not complete all the requirements in this time limit shall forego admission and will be removed from the rolls of the Institute

13.2 A student shall be eligible for award of B. Tech degree provided she or he has:

13.2.1 Registered and successfully completed all required credit-bearing and mandatory subjects with a total of 160 credits

13.2.2 Secured a CGPA of 4.5 or more

13.2.3 Cleared all dues to the Institute, library, and hostel

13.2.4 No disciplinary action is pending against her or him

13.2.5 Satisfied any other stipulation of the affiliating University

13.3 *Award of Class*: Each student will be given class in degree based on CGPA as follows:

Table 2 Class of Degree

Class of Degree	Range of CGPA
Pass Class	>= 4.5 but <5.5
Second Class	>= 5.5 but <6.5
First Class	>= 6.5 but <7.5
First Class with Distinction	>= 7.5

13.4 *Honours*: A student who registers and earns 20 extra credits in her/his own major will be given honours degree. Affiliating university guidelines shall apply for award of Honours

13.5 *Minor Degree*: A student who registers and earns 20 extra credits in any minor stream will be awarded minor degree in that minor stream. Affiliating university guidelines shall apply for award of Minor degree

13.6 Degree will be issued under the seal of affiliating University

14.0 Transitory Regulations

14.1 A student who initially joins the Institute in a previous Regulation and must re-join in a semester of the present Regulations, due to any reason, shall be bound by the rules of the current Regulations. Board of Studies of the concerned Major will specify, extra or otherwise, academic coursework to be undertaken by such students who join the current Regulations.

VII Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	C
1801701	PCC	Engineering Economics, Estimation & Costing	2	1	0	30	70	3
1801702	PCC	Design of Reinforced Concrete Structures – 2	2	1	0	30	70	3
1801703	PCC	Design of Steel Structures	2	1	0	30	70	3
1801704	PCC	Water Resources Engineering – 2	2	0	0	30	70	2
1801705	PCC	Sanitary & Solid Waste Management	2	0	0	30	70	2
PEC 3	PEC 3	PEC 3	2	0	0	30	70	2
OEC 2	OEC 2	OEC 2	2	0	0	30	70	2
OEC 3	OEC 3	OEC 3	2	0	0	30	70	2
1801728	PROJ	Project – 1 (Project work, seminar, and internship in industry or at appropriate workplace)	0	0	12	100	0	3
		Total	**16**	**3**	**12**	**340**	**560**	**22**

VIII Semester

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	C
1801801	PCC	Repairs & Rehabilitation of Structures	2	0	0	30	70	2
MC 3	MC 3	Organizational Behavior	2	0	0	30	--	0
PEC 4	PEC 4	PEC 4	2	1	0	30	70	3
OEC 4	OEC 4	OEC 4	2	0	0	30	70	2
1801823	PROJ	Project – 2 (Continued from 7th Semester, Project work, seminar, and internship in industry or at appropriate workplace)	0	0	12	50	50	5
		Total	**8**	**1**	**12**	**170**	**260**	**12**

Professional Elective Courses (PEC)

Subject	PEC 3	PEC 4
Structural Engineering	1. Advanced Structural Analysis by Matrix Methods	1. Bridge Engineering 2. Finite Element Methods
Geotechnical Engineering	1. Advanced Foundation Engineering 2. Soil Dynamics & Machine Foundation	1. Environmental Geo-Technology
Transportation Engineering	1. Intelligent Transportation Systems	1. Urban Transportation Planning.
Construction Engineering & Management	1. Construction Project Planning & Systems	
Environmental Engineering	1. Environmental Impact Assessment	
Hydraulics, Hydrology & Water Resources Engineering	1. Integrated Watershed Management	1. Design and Drawing of Irrigation Structures

List of Professional Elective Subjects for R18 Curriculum

S. No	Subject Code	Subject
01	1801706	Advanced Structural Analysis by Matrix Methods
02	1801707	Advanced Foundation Engineering
03	1801708	Soil Dynamics & Machine Foundation
04	1801709	Intelligent Transportation Systems
05	1801710	Construction Project Planning & Systems
06	1801711	Environmental Impact Assessment
07	1801712	Integrated Watershed Management
08	1801803	Bridge Engineering
09	1801804	Finite Element Methods
10	1801805	Environmental Geo-Technology
11	1801806	Urban Transportation Planning
12	1801807	Design and Drawing of Irrigation Structures

List of Open Elective (OE) Subjects for R18 Curriculum

S. No	Subject Code	Subject
01	18OE103	Building Technology
02	18OE104	Estimating and Costing
03	18OE105	Water Supply Engineering
04	18OE106	Construction Practice and Management
05	18OE107	Disaster Preparedness
06	18OE108	Rehabilitation of Structures

VII Semester
Syllabus

Course Title	Engineering Economics, Estimation & Costing				Program & Sem.		B. Tech. & VII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801701	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	01	00	03	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours		

Course Objectives:

- To impart basic knowledge on different types of specifications of items of works, understand the types and methods of estimates
- To analyze the quantities of item of works for different components of a building.
- To interpret the rates of different items of works involved in a construction activity.
- To evaluate the quantity of reinforcement for different structural elements of a building.
- To formulate the contract documents for a project; and valuate a property.

UNIT-I

Specifications and Introduction to the Estimation of Structures

Specifications: Specification of Different Items of Works: Types - Standard Specifications for Different Items of Building Construction – Earth Work for Foundations, Mortars, Foundation Concrete, Reinforced Concrete, Brick Work, Stone Masonry, Mosaic Flooring, Terrazo Flooring, RCC Roof and AC Roof and GI Sheets, Plastering, Painting, Pointing and Wood Works.

Introduction to the Estimation of Structures: Introduction, Different Item of Works – Units of Item of Works – Types of Estimates – Methods of Estimates.

UNIT – II

Quantity Estimation of Buildings

Estimation of Quantities in Buildings: Load Bearing Wall Structure of Single Room and Multi Room; Framed structure: Multi room.

UNIT – III

Rate Analysis

Rate Analysis of Different Item of Works: Earthwork Excavation – Mortars of Various Proportions (Cement and Lime) – Concrete with Various Proportions (Lime and Cement) – Brick Masonry – Stone Masonry – Pointing – Painting – Plastering – Aluminium Partitions – Wooden Partitions – Cement Concrete Flooring With 1:2:4 Mix – Ceramic and Vitrified Tile Flooring and Mosaic Flooring.

UNIT – IV

Estimation of Bar Bending Schedule

Beams – Columns - Slabs – Staircases – Sunshade – Lintels – Portico

UNIT – V

Contracts and Valuation

Contracts: Types of Contracts, Contract Document, Conditions of Contracts, Contract Procedure, Termination of Contracts, Specifications, Important Conditions of Contract, Arbitration and Tenders.

Valuation: Introduction, Technique of Valuation, Elements of Valuation and Factors Affecting Valuation, Methods of Valuation to the Land Property and Building Property, Mortgage.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Define the specifications for several items of works and identify the suitable method of estimate for a structure.
CO 2:	Categorize the number of items of works and calculate the total quantity of the items of works for the components of a building.
CO 3:	Determine and prepare the rates of all items of works involved in a construction activity.
CO 4:	Assess and measure the quantity of reinforcement for different structural components.
CO 5:	Frame a contract document for a project; and get adapted in valuing a property.

Mapping of COs with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2					1	1	2			1				
CO 2	3	2	2	1			2	2			3	1	3		1
CO 3	3	3	2	1			2				1	1	3		1
CO 4	3	3	2	1			2				1	1	3		1
CO 5							2	2		3	3	1	3		

Textbooks:

1. B N Dutta "Estimating and Costing in Civil Engineering", U B S Publishers Distributers Pvt. Limited, Noida.
2. "Standard Data Book – Vol.2", Andhra Pradesh Department of Standard Specifications, Amaravati.

Reference Books:

1. Dr. Roshan H Namavati "Professional Practice", The Lakhani Book Depot, Mumbai.
2. S C Rangwala "Estimating Costing and Valuation", Charotar Publishing House Pvt. Limited, Anand.

Course Title	Design & Detailing of Reinforced Concrete Structures – 2				Program & Sem.		B. Tech. & VII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801702	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	01	00	03	30	70	100
Mid Exam Duration: 2Hours					End Exam Duration: 3Hours		

Course Objectives:

- To understand the importance of limit state serviceability.
- To design stair slabs under different support mechanisms.
- To calculate the loadings on structural walls & retaining walls and their design.
- To give exposer on types of foundations and their design.
- To analyse and design rectangular and circular water tanks.

UNIT-I

Serviceability Limit State Method:

Short-term Deflections-Load deflection behavior of RCC beam, factors influencing deflection, deflection of simply supported and continuous beams; Long-term Deflection-due to creep, shrinkage, and temperature; deflection of slabs; Cracking in RCC members-types of cracks, mechanism of cracking, Limiting the crack width, crack control provisions.

UNIT – II

Design of staircases:

Types of staircases, loads on staircases, design of stair slabs spanning transversely & longitudinally, helicoidal staircases.

UNIT – III

Design of RC Walls

Types of RC walls, loading bearing walls - Braced and un-braced walls, eccentricities, slenderness ratio & effective height of walls, design of walls subjected to horizontal and vertical loads; Structural walls - Types and design of structural walls.

Retaining Walls- Types of retaining walls, theory of earth pressure, stability and soil bearing pressure requirements, design of cantilever retaining wall.

UNIT – IV

Design of Footings

Types of footing, soil pressure under footing, Isolated Footings -shear, bending moment & development length considerations, design of square and rectangular footing; Combined Footings -Design of two-column rectangular, trapezoidal & T-shaped footings; Design of piles - Behaviour of piles, static formula for pipe capacity, pile grouping, design of under reamed piles.

UNIT – V

Design of Water Storage Tanks

Types of water tanks, design of circular and rectangular water tanks, design of underground water tanks.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Design all the basic structures for limit state of serviceability.
CO 2:	Design and detailing of different RCC staircases.
CO 3:	Design load bearing walls, structural walls and cantilever earth retaining walls.
CO 4:	Design square and rectangular isolated footings, different combined footings, and pile foundation.
CO 5:	Design the Underground and Over the Ground Supported water tanks.

Mapping of COs with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	3			2							3		
CO 2	1	2	3			2							3		
CO 3	1	2	3			2							3		
CO 4	1	2	3			2							3		
CO 5	1	2	3			2							3		

Textbooks:

1. N. Subramanian "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi.
2. P.C. Varghese "Advanced Reinforced Concrete Design", Prentice-Hall of India private Limited, New Delhi.

Reference Books:

1. M L Gambhir "Fundamentals of Reinforced Concrete Design", PHI Learning Pvt. Limited, New Delhi.
2. P C Varghese "Limit State Design of Reinforced Concrete", PHI Learning Pvt. Limited, New Delhi.
3. IS 456-2000 "Indian Standard Code of Plain and Reinforced Concrete – Code of Practice", Bureau of Indian Standards, New Delhi.
4. IS 3370-2009 "Indian Standard Code of Concrete Structures for Storage of Liquids – Code of Practice", Bureau of Indian Standards, New Delhi.

Course Title	Design of Steel Structures				Program & Sem.	B. Tech. & VII	
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801703	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	01	00	03	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours		

Course Objectives:

- The student acquires knowledge about elastic & plastic methods to analyze the structural elements.
- The students understand about different types of tension & compression members and to analyze easily by limit state design.
- To make the student able to analyze various beams like laterally supported & laterally unsupported beams.
- To make the students to understand the beam to beam & beam to column connections.
- Students easily understand the design of slab base and gusseted based and subjected to moments.

Unit – I

Plastic Analysis and Welded Connections

Plastic Analysis: Introduction – Idealized Stress – Strain Diagram – Shape Factors for Various Sections – Moment Curvature Relationship – Ultimate Moment – Plastic Hinge – Lower and Upper Bound Theorems – Ultimate Strength Fixed and Continuous Beams – Frames.

Welded Connections: Introduction – Advantages and Disadvantages of Welding – Strength of Welds – Butt and Fillet Welds – Permissible Stresses – IS Code Requirements – Design of Welds Subjected to Moment Acting in the Plane and at Right Angles to the Plane of the Joints – Beamto Beam and Beam to Column Connections.

Unit – II

Design of Tension and Compression Members

Tension Members: Types of Sections – Net Effective Section for Angles and Tees in Tensions - Lug Angles – Tension Splices

Compression Members: Plain and Built-Up Compression Members – Assumptions RegardingEnd Conditions – Design of Built-Up Columns with Battens and Lacings – Splicing of Column.

Unit – III

Beams

Allowable Stresses – Design Requirements as per IS Code – Design of Simple and Compound Beams- Curtailment of Flange Plates – Beam to Beam Connections – Check for Deflections – Shear – Buckling – Check for Bearing – Laterally Unsupported Beams.

Unit – IV

Design of Beam to Column Connections

Introduction – Design of Beam to Column Connections – Framed, Stiffened, Un-Stiffened and Seated Bracket Connections.

Unit – V

Design of Column Bases

Design of Slab Base and Gusseted Bases – Column Bases subjected to Moment.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Design the different types of structural steel sections in limit state design
CO 2:	Understand the concept of design of tension and compression members and to analyze easily.
CO 3:	Develop knowledge about different type of beams and design easily to laterally supported & unsupported beams.
CO 4:	Understand the concept of beam to beam and beam to column connections like stiffened and unstiffened seated connections and their usage in the steel constructions.
CO 5:	Understand the design of column base & gusseted base concept easily and their usage in any structural steel constructions.

Mapping of COs with POs and PSOs:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	1	1							1	3		2
CO 2	3	3	3	1	1							1	3		2
CO 3	3	3	3	2	1							1	3		2
CO 4	3	3	3	2	1							1	3		2
CO 5	3	3	3	2	1							1	3		2

Textbooks

1. S K Duggal "Limit State Design of Steel Structures", Tata McGraw-Hill Companies, Inc. New York.
2. S S Bhavikatti "Design of Steel Structures", I K International Publishing House Pvt. Limited, New Delhi.

Reference Books / Is Codes / Tables

1. IS 800 – 2007 "Indian Standard Code of Practice for General Construction in Steel", Bureau of Indian Standards, New Delhi.
2. IS 875 – Part – 3 "Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Building and Structures – Wind Loads", Bureau of Indian Standards, New Delhi.
3. K L V Ramu and Subhash Chander "Steel Tables – SI Units", Jain Brothers, New Delhi.

Course Title	Water Resources Engineering-2					Program & Sem.	B. Tech. & VII	
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1801704	PCC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- To study the different measures to prevent damages of Floods and their remedial measures.
- To study the various factors considering for construction of different head works i.e., canal head works, cross drainage works etc.,
- To study the different components and their applications
- To study the various design procedures and their engineering significances
- To study the different tools required for knowing performance of water resources projects

Unit – I

Spillways

Types of Spillways – Necessity and Components of Spillways – Applications of Spillways – Design Principles of Ogee Spillways – Types of Spillway Gates – Energy Dissipation Methods.

Unit – II

Canal Structures – 1

Types of falls and Their Location – Design Principles of Sarda type Fall – Trapezoidal Notch Fall and Straight Glacis Fall.

Unit – III

Canal Structures – 2

Canal Regulation Works – Principles of Design of Distribution and the Head Regulator – Canal Outlets – Types of Canal Modules – Proportionality Sensitivity and Flexibility.

Unit – IV

Cross Drainage Works

Types of Selection of Site – Design Principles of Aqueduct – Siphon Aqueduct and Super Passage.

Unit – V

Water Resources Planning

Introduction to Indian Water Resources – Scenario of Water Use – Purpose of Water Resource Development – Classification of Water Resources – Development Projects – Simulation – Process of Project Formulation – Project Evaluation – Strategies for Future – Planning Strategies – Management Strategies.

Course Outcome:

On completion of the course, the student will be able to:

CO 1	Develop and design different energy dissipation methods and safety structures to mitigate Flood damages.
CO 2	Knowing design principles and different design approaches in Canals.
CO 3	Know the responsibility of a civil engineer for constructions of canal outlets, canal escapes; cross drainage works in reducing the floods.
CO 4	Design hydraulic structures and regulatory works using different methods.
CO 5	Predict the cost benefit analysis and give insights for the benefit of society.

Mapping COs with POs and PSOs

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	1	3							3	2	1
CO 2	2	2	3	1	1	1	1						3		1
CO 3	2		1			3		3						3	
CO 4	3	3	3	2	1	3	1						3	1	
CO 5	3	2	1		1	3	3						3	3	1

Textbooks

1. G L Asawa "Irrigation and Water Resources Engineering", New Age International (P) Limited, Publishers, New Delhi.
2. R S Varshney, S C Gupta and R L Gupta "Theory and Design of Irrigation Structures", Nem Chand & Bros Publishers, Roorkee, Uttarakhand.

Reference Books

1. Satya Narayana Murty Challa "Water Resources Engineering – Principles and Practice", New Age International (P) Limited, Publishers, New Delhi.
2. B C Punmia, Pande B B Lal, Ashok Kumar Jain & Arun Kumar Jain "Irrigation and Waterpower Engineering", Lakshmi Publications, New Delhi.

Course Title	Sanitary Engineering & Solid waste Management					Program & Sem.		B. Tech. & VII
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1801705	PCC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives: With the successful completion of the course, the student should have the capability to:

- To estimate sewage and storm water from towns and to design the sewage
- To focus on planning, design and operation of wastewater treatment units.
- To treat the sewage Effluent
- To illustrate different practices in sludge management.
- To illustrate air and noise pollutions and solid waste.

Unit - I

Estimation of Sewage and Strom Water, Collection of Sewage-Estimation of Sewage and Storm Water: Definition of Terms – Sewage, Sullage, Storm Water and Sludge – Objectives of Sewage and Storm Water Estimations and General Methods Available for Estimations in Urban Areas – Average, Peak and Minimum Sewage Flows and their Importance in Collection and Treatment Systems.

Collection of Sewage: Sewage Collection by Different Sewers and their Functions – Separate and Combined Sewers and their Merits and Demerits – Hydraulic Design of Sewers for Full and Partial Flow System – Self-Cleansing Velocity of Sewers – Sewer Appurtenances and their Location and Functions.

Unit - II

Characterization of Sewage, Preliminary and Primary Treatment-Characterization of Sewage: Objectives of Sewage Characterization – Frequency of Sampling of Sewage for Different Parameters – Chemical Composition of Sewage – Solids, BOD and COD, Nutrients and Biological Impurities – Numerical Problems on BOD Equation – Population Equivalent – Carbon, Nitrogen and Sulphur Cycles.

Preliminary and Primary Treatment: Basic Concept of Sewage Treatment – Preliminary, Primary, Secondary and Tertiary Sewage Treatment Processes – Sewage Treatment Process – Design of Bar Screen, Grit Chamber and Primary Sedimentation Tanks.

Unit -III

Secondary Treatment-Necessity of Secondary Treatment – Principles of Biological Treatment of Sewage – Suspended and Attached Growth of Biological System – Design of Conventional type of Activated Sludge Processes – Aerated Lagoons and Oxidation Ponds – Design of Secondary Sedimentation Tanks – Operational Problems of Biological Treatment Process Units.

Unit -IV

Tertiary Treatment and Sludge Management-Tertiary Treatment: Objectives of Tertiary Treatment – Removal of Nitrogen, Phosphorus, and Refractory Organics from Secondary Treated Sewage – Standards for Disposal of Treated Sewage into Inland Surface Waters, Marine Disposal and on Land for Investigation.

Sludge Management: Sludge Stabilization by Aerobic and Anaerobic Processes – Sludge Dewatering Practices – Sludge Drying Beds and Centrifugation. Sludge Disposal Practices – Design of Septic Tank and Soak Pits.

Unit -V

Solid Waste Management, Air and Noise Pollution-Solid Waste Management: Sources, Characteristics and Generation of Solid Wastes – Collection and Disposal – Design and Management of Sanitary Landfills.

Air and Noise Pollution: Types of Air Pollutants – Sources and Effect of Air Pollution – Air Pollution Metrology – Air Pollution Control – Air Quality Standards and Limits – Sources and Effects of Noise Pollution – Measurement of Noise and Control of Noise Pollution – Permissible Limits of Noise Pollution.

Course Outcome:

On completion of the course, the student will be able to:

CO 1	To understand the estimation of sewage and hydraulic design for storm water sewage.
CO 2	Understanding the physical and biological composition of sewage and characterization of sewage treatment processes.
CO 3	Apply the knowledge on sewage treatment and efficient design of conventional treatment of sludge processes.
CO 4	Efficient design of solid waste management system requires details investigation of sources physical and chemical properties of waste, conveyance, disposal method and sludge dewatering processes.
CO 5	Understanding and designing of solid waste management system require application of waste management.

Mapping COs with POs and PSOs

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3		2	2	2	3	1		2		2	2		
CO 2	3	2	3	2	2		1			1		2	2		
CO 3	2	2	3	2	3	2	3		2			2	2		
CO 4	3	2	3	2	2	2	3	2	2			2	3		
CO 5		2			3	3	3	3				2	3		

Textbooks

1. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain "Wastewater Engineering", Lakshmi Publications, New Delhi.

Reference Books

1. Met Calf & Eddy "Wastewater Engineering – Treatment and Reuse", Tata McGraw-Hill Companies, Inc. New York.
2. H S Peavy and D R Rowe "Environmental Engineering" Tata McGraw-Hill Companies, Inc. New York.

Course Title	Advanced Structural Analysis by Matrix Methods					Program & Sem.		B. Tech. & VII
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1801706	PEC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs.						End Exam Duration: 03.00 Hrs.		

Course Objectives: The course is designed to students,

- To introduce stiffness method and flexibility method for analysis of statically indeterminate structures.
- To understand the basics of finite element method and application to structural analysis.
- Use and/or develop structural analysis software to analyze complicated structural systems.
- Interpret the output from computer-based analyses for the purpose of structural design

Unit – I

Introduction to Matrix methods

Introduction, coordinate systems, displacement and force transformation matrices, element and structure stiffness matrices, Element and structure flexibility matrices, equivalent joint loads, stiffness, and flexibility approaches.

Unit – II

Matrix methods for beams

Analysis of fixed and continuous beams by flexibility method. Analysis of fixed and continuous beams by stiffness method.

Unit – III

Matrix methods for Plane truss problems

Analysis of 2-D trusses by flexibility method, Analysis of 2-D trusses by stiffness method

Unit – IV

Matrix methods for Plane Frames

Analysis of 2-D frames by Flexibility matrix methods.

Unit – V

Matrix methods for Plane Frames

Analysis of 2-D frames by Stiffness matrix methods.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Identify static and dynamic indeterminacy of structure and can apply matrix methods to analyse the structures.
CO 2:	Analyse the continuous beams using stiffness and flexibility methods.
CO 3:	Analyse two dimensional portable frames using stiffness and flexibility methods.
CO 4:	Analyse two-dimensional pin-jointed trusses using stiffness and flexibility methods.
CO 5:	Transform local coordinate system to global coordinate system in matrix methods.

Mapping of COs with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	2	1					1			3		1
CO 2	3	3	3	3	2					1		1	3		2
CO 3	3	3	3	3	2					1		1	3		2
CO 4	3	3	3	3	2					1		1	3		2
CO 5	3	3	2	3	2					1		1	3		2

Textbooks:

1. G. S. Pandit and S. P. Gupta, "Matrix Methods of Structural Analysis", Tata McGraw-Hill Companies, Inc. New York.
2. M W Weaver and Gere, "Matrix Analysis of framed Structures", Van Nostrand Reinhold.

Reference Books:

1. Devdas Menon, "C.K Wang Advanced Structural Analysis", Narosa Publishing House.
2. Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co., USA.
3. C.K Wang, "Analysis of Indeterminate Structures", Tata McGraw-Hill Companies, Inc. New York.

Course Title	Advanced Foundation Engineering				Program & Sem.	B. Tech. & VII	
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801707	PEC 3	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		03	00	00	03	30	70	100
Mid Exam Duration: 2Hours					End Exam Duration: 3Hours		

Course Objectives:

- To explain how the earth pressure acting on sheet pile
- To explain the concepts of braced cuts and how to calculate the lateral pressure at different locations
- To explain the concepts of Terzaghi and IRC Methods and individual components
- To explain the concepts of collapsible and expansive soils and design of foundations
- To explain different methods of ground improvement techniques

UNIT – I

Bulkheads: Types of Sheet Pile Walls – Free Cantilever Sheet Pile – Cantilever Sheet Pile in Cohesionless and Cohesive Soils – Anchored Sheet Pile with Free Earth Support – Rowe's Moment Reduction Curves – Anchored Sheet Pile with Fixed Earth Support – Design of Anchors

UNIT – II

Braced Cuts and Coffer Dams

Braced Cuts – Introduction – Lateral Earth Pressure on Sheeting's – Different Types of Sheeting and Bracing Systems – Design of Various Components of Bracings.

Coffer Dams – Types of Coffer Dams – Design of Circular Coffer Dams on Rock – Design of Cellular Coffer Dams on Soil.

UNIT – III

Well Foundations: Introduction – Different Shapes of Wells – Grip Length – Forces Acting on the Well Foundation – Terzaghi's Analysis – Banerjee and Gangopadhyay's Analysis – Simplified Analysis for Heavy Wells – IRC Method – Individual Components of the Well – Sinking of Wells – Measures for rectification of Tilts and Shifts.

UNIT – IV

Foundations on Collapsible and Expansive Soils

Collapsible Soils – General Considerations and observations – Computation of Collapse Potential and Settlement – Foundation Design – Treatment Methods.

Expansive Soils – Distribution of Expansive Soils – General Characteristics – Clay Mineralogy and Mechanism of Swelling – Definition of Some Parameters – Evaluation of Swelling Potential of Expansive Soils – Classification of Swelling Soils by Indirect Measurement – Swelling Pressure by Direct Measurements – Effect of Initial Moisture Content and initial Dry Density on Swelling Pressure – Estimating the Magnitude of Swelling – Design of Foundations in Swelling Soils – Elimination of Swelling.

UNIT – V

Soil Stabilization: Introduction – Mechanical Stabilization – Cement Stabilization – Lime Stabilization – Bituminous Stabilization – Chemical Stabilization – Thermal Stabilization – Electrical Stabilization, Stabilization by Grouting – Stabilization by Geo-Textile and Fabrics – Reinforced Earth.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Analyse and design the depth of embedment for sheet pile and forces in the anchor.
CO 2:	Determine the loads / forces on the struts and bending moment in Wells, sheet piles and design of coffer dam
CO 3:	Analyze and design well foundation including complete stability analysis
CO 4:	Determine the swell, uplift capacity, and factor of safety
CO 5:	Importance and difficulties in stabilization

Mapping of Cos with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 12	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3		2						2	3		2
CO 2	3	3	3	3		2						2	3		2
CO 3	3	3	3	3		2						2	3		2
CO 4	3	3	3	3		2						2	3		2
CO 5	3	3	3	3		2						2	3		2

Textbooks:

1. Dr. K R Arora "Soil Mechanics & Foundation Engineering", Standard Publishers Distributers, New Delhi.
2. V N S Murthy "Advanced Foundation Engineering", C B S Publishers & Distributors, New Delhi.

Reference Books:

1. Joseph E. Bowles "Foundation analysis & Design", Tata McGraw-Hill Companies, Inc. New York.
2. Braja M Das "Principles of Foundation Engineering", Thomson Publishers, United States.
3. Dr. P Purushothama Raj "Ground Improvement Techniques", Lakshmi Publications, New Delhi.

Course Title	Soil Dynamics & Machine Foundation				Program & Sem.		B. Tech. & VII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801708	PEC 3	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 2Hours					End Exam Duration: 3Hours		

Course Objectives:

- To explain the significance of dynamic load in machine foundation analysis
- To explain theory of vibration for different field conditions
- To explain the principles of machine foundation design for reciprocating and impact machines
- To explain the concept and method of foundation isolation

Unit - I

Introduction - nature of dynamic loads - stress conditions on soil elements under earthquake loading - dynamic loads imposed by simple crank mechanism - type of machine foundations - special considerations for design of machine foundations.

UNIT – II

Theory of vibration: general definitions - properties of harmonic motion - free vibrations of a mass- spring system - free vibrations with viscous damping - forced vibrations with viscous damping - frequency dependent exciting force - systems under transient forces - Raleigh's method - logarithmic decrement - determination of viscous damping - principle of vibration measuring instruments - systems with two degrees of freedom.

UNIT – III

Criteria for a satisfactory machine foundation - permissible amplitude of vibration for different type of machines - methods of analysis of machine foundations - methods based on linear elastic weightless springs - methods based on linear theory of elasticity (elastic half space theory) - methods based on semi graphical approach - degrees of freedom of a block foundation - definition of soil spring constants - nature of damping - geometric and internal damping - determination of soil constants – methods of determination of soil constants in laboratory and field based on IS code provisions.

UNIT – IV

Vertical, sliding, rocking, and yawing vibrations of a block foundation - simultaneous rocking, sliding and vertical vibrations of a block foundation - foundation of reciprocating machines - design criteria - calculation of induced forces and moments - multi-cylinder engines - numerical example (IS code method).

UNIT – V

Foundations subjected to impact loads - design criteria - analysis of vertical vibrations - computation of dynamic forces - design of hammer foundations (IS code method) - vibration isolation - active and passive isolation - transmissibility - methods of isolation in machine foundations.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Analyse and design the depth of embedment for sheet pile and forces in the anchor.
CO 2:	Determine the loads / forces on the struts and bending moment in sheet piles and design of coffer dam
CO 3:	Analyse and design well foundation including complete stability analysis
CO 4:	Determine the swell, uplift capacity, and factor of safety
CO 5:	Importance and difficulties in stabilization

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	2	3										3		
CO 2	1	2	3										3		
CO 3	1	2	3			1							3		
CO 4	1	3	3			1							3		
CO 5	1	2	3										3		

Textbooks:

1. Shamsher Prakash, Soil Dynamics, McGraw-Hill, 1981.

Reference Books:

1. Alexander Major, Dynamics in Soil Engineering, A Kademiai, 1980.
2. Sreenivasalu and Varadarajan, Handbook of Machine Foundations, Tata McGraw-Hill, 2007.
3. IS 2974 - Part I and II, Design Considerations for Machine Foundations
4. IS 5249: Method of Test for Determination of Dynamic Properties of Soils

Course Title	Intelligent Transportation Systems					Program & Sem.		B.Tech. & VII
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1801709	PEC 3	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- To gain knowledge on intelligent transportation systems (ITS) and its objectives and benefits
- To ascertain different data collection techniques on ITS
- To know the different telecommunication systems in ITS
- To understand the impact of technology on different modes and movement
- To study the automated highway systems across the globe

UNIT – I

Intelligent Transportation Systems: Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS.

UNIT – II

ITS Data collection techniques: Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

UNIT – III

Telecommunications in ITS: Importance of telecommunications in the ITS system, Information Management, Traffic Management Centers (TMC). Vehicle – Roadside communication – Vehicle Positioning System; ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

UNIT – IV

ITS User Needs and Services: Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

UNIT – V

Automated Highway Systems: Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries.

Course Outcome:

On completion of the course, the student will be able to:

CO 1	Understand the historical background, objectives, and benefits of ITS
CO 2	Develop an understanding on ITS data collection techniques
CO 3	Describe various telecommunication systems in ITS
CO 4	Understand various user needs and services in ITS
CO 5	Understand different ITS programs, ITS implementations in developed and developing countries

Mapping COs with POs and PSOs

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3					3	1					1	3	1	
CO 2	3	3	3	2	2							1	3		1
CO 3	3				2								3		
CO 4	2	3	3	3	2	2						1	3		1
CO 5	2	3	3	2	2	2	2						3		1

Textbooks

1. Intelligent Transport System by Pradip Kumar Sarkar and Amit Kumar Jain, PHI Learning Pvt Ltd., New Delhi.

Reference Books

1. Fundamentals of Intelligent Transportation Systems Planning by M.A Chowdary and A. Sadek, Artech House, London-2003.
2. Synthesis Report on ITS Including Issues and Challenges in India by, Centre of Excellence In Urban Transport, IIT, Chennai.

Course Title	Construction Project Planning and Systems					Program & Sem.		B. Tech. & VII
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1801710	PEC 3	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- **Understand** the importance of construction management, resources and stages of Planning
- To know how to prepare scheduling in construction activity. significance of PERT and CPM and make use of these two techniques how to develop a network diagram for construction
- To know various types of equipment in construction and applications mechanisation in construction
- Understand importance of inspection and how to maintain quality in different stages. Recognize the Importance of safety measures in construction
- To know the importance of contractual system and carefulness in legal issues during and after the construction.

UNIT – I

Introduction: History of Construction Management, Functions and Responsibilities of Construction Manager, Resources and Advances in Construction Management. Stages and Major problems in Construction Industry.

UNIT – II

New Techniques in construction Management: Work Breakdown of structures, Development of Bar charts, Shortcomings, Remedial measures, Milestone charts. PERT- Elements of Networks, Development of PERT network, Numbering, Fulkerson's rule, Slack, Identification of Critical Path, Probability of Completion of projects. CPM – Construction of network, Start and Finish times of activities, Floats, Identification of Critical Path using floats.

UNIT – III

Construction Equipment and Management. Equipment Requirements in Construction Industry, Heavy Earth Moving Equipment – Bulldozers, Scrapers, Loaders Shovels and Cranes – Compaction Equipment, Grading Equipment, Aggregate Production Equipment, Hauling Equipment, Concrete Mixing Equipment, Pneumatic Equipment, Bridge Construction Equipment, Drilling and Blasting Equipment, Pumping and Dewatering Equipment.

UNIT – IV

Inspection and Quality Control and safety management. Inspection and Quality Control: Need for Inspection and Quality Control Principles of Inspection – Enforcement of Specifications – Stages of Inspection and Quality Control. Safety Management: Safety importance in construction industry, hazards in construction projects, causes of accidents, cost of an accidents.

UNIT – V

Contracts and Legal issues: Contracts: Execution of Works, Direct execution by Department, Execution through contractor – Definitions – Types of contracts. Legal Issues: Earnest money deposit and Security deposit, Termination of contract. Disputes, Settlement through arbitration,

Indian Arbitration Act 1940, Clauses and advantages of arbitration, Contract Labor Act 1970, Minimum Wages Act 1948, Workmen Compensation Act 1923

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Broad View on construction before and after execution
CO 2:	Expertize on scheduling of construction with latest techniques
CO 3:	Understand the benefit and productivity of mechanization in construction
CO 4:	Know the value of quality and safety in construction
CO 5:	Aware of contractual system and enlarged view on legal problems in construction

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	2			3		2	2	3		3		
CO 2	2	3	2	1	1	1			1	1	3		3		1
CO 3	2	1	1		5					2	2		3	1	
CO 4	3	1	1			2	3	2	1				3	3	
CO 5	3			2		3	1	3	2	2			3	3	

Textbooks

1. P S Gahlot and B M Dhir "Engineering Construction Planning and Management", New Age International (P) Limited, Publishers, New Delhi.
2. S C Sharma "Construction Equipment and Its Management", Khanna Publishers, New Delhi.

Reference Books

1. M Govindarajan, S Natarajan and V S Senthilkumar "Engineering Ethics", Prentice-Hall of India (P) Limited, New Delhi.
2. Dr. S Seetharaman "Construction Engineering and Management", Umesh Publications, New Delhi.
3. Horpal Singh "Construction Management and Accounts", Tata McGraw-Hill Companies, Inc. New York.

Course Title	Environmental Impact Assessment					Program & Sem.		B.Tech. & VII
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
1801711	PEC 3	02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- Deals with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same.
- The student can know about the various impacts of development projects on environment and the mitigating measures.

UNIT – I

Basic Concepts of EIA: Initial Environmental Examination – Elements of EIA – Factors Affecting E-I-A – Impact Evaluation and Analysis – Preparation of Environmental Base Map – Classification of Environmental Parameters.

UNIT – II

EIA Methodologies: Introduction – Criteria for the Selection of EIA Methodology – E I A Methods – Ad-Hoc Methods – Matrix Methods – Network Method – Environmental Media Quality Index Method – Overlay Methods and Cost/Benefit Analysis

UNIT – III

Impact of Developmental Activities and Land Use: Introduction and Methodology for the Assessment of Soil and Ground Water – Delineation of Study Area – Identification of Actives – Procurement of Relevant Soil Quality – Impact Prediction – Assessment of Impact Significance – Identification and Incorporation of Mitigation Measures – E I A in Surface Water – Air and Biological Environment – Methodology for the Assessment of Impacts on Surface Water Environment – Air Pollution Sources – Generalized Approach for Assessment of Air Pollution Impact.

UNIT – IV

Assessment of Impact on Vegetation and Wildlife, Environmental Audit

Assessment of Impact on Vegetation and Wildlife: Introduction – Assessment of Impact of Development Activities on Vegetation and Wildlife –Environmental Impact of Deforestation – Causes and Effects of Deforestation.

Environmental Audit: Introduction - Environmental Audit & Environmental Legislation – Objectives of Environmental Audit – Types of Environmental Audit – Audit Protocol – Stages of Environmental Audit – Onsite Activities – Evaluation of Audit Data and Preparation of Audit Report.

UNIT – V

Environmental Acts (Protection and Prevention): Post Audit Activities – The environmental Protection Act – The Water Prevention Act – The Air (Prevention and Control of Pollution Act) – Wildlife and Preparation of Environmental Impact Assessment Statement for Various Industries.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Perform a critical quality review of an EIA and EIS.
CO 2:	Structure the EIA working process considering the need for interdisciplinary.
CO 3:	Perform the screening and scoping of an EIA, based on existing requirements, evaluate the impacts and draw meaningful conclusions from the results of the EIA.
CO 4:	Clarify the concept of EIA and its application in an international context to those involved in or affected by the EIA process.
CO 5:	Interpretation an EIA, present its conclusions and translate its conclusions into actions.

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2				3	3	2		1				3	
CO 2	2	2	1			3	3	2	2	1	3		3	3	
CO 3	2	2	1			3	3	2	2	1	1		3	3	
CO 4	2	2	1			3	3	2	1	1	1		3	3	
CO 5	2	2	1			3	3	2	1	1	1		3	3	

Textbooks

1. Y Anjaneyulu and Valli Manickam "Environmental Impact Assessment Methodologies", B S Publications, Sultan Bazar, Hyderabad.
2. J Glynn Henry and Gary W Heinke "Environmental Science and Engineering", Prentice-Hall of India (P) Limited, New Delhi.

Reference Books

1. Dr. Suresh K Dhameja "Environmental Science and Engineering", S K Kataria & Sons Publishers, New Delhi.
2. H S Bhatia "Textbook on Environmental Pollution and Control", Galgotia Publications Pvt. Limited, New Delhi.
3. Rau and Wooten "Environmental Impact Analysis Handbook", Tata McGraw-Hill Companies, Inc. New York.

Course Title	Integrated Watershed Management				Program & Sem.	B. Tech. &VII	
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1801712	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	01	00	03	30	70	100
Mid Exam Duration: 2Hours					End Exam Duration: 3Hours			

Course Outcomes:

- Student understands the processes leading to degradation of soil and water resources and implementation of conservation measures.
- Water shed development programme is proper use of all available resources of a watershed for optimum production with minimum hazards to natural resources
- To know deferent water and soil conservation structures to improve the ground water table
- To understand basin characteristics and to know the ridge to valley concept to save downstream people.
- To impart the principles of managing water form watershed to river basin scale.

Unit – I

Introduction to Watershed

Watershed delineation - Watershed development - Definition and concepts - objectives and need - Integrated and multidisciplinary approach for watershed management - Characteristics of watershed - Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils - Hydrology and hydrogeology - Socio-economic characteristics.

Unit – II

Watershed Management

Definition of watershed management – Factors affecting watershed management - Preparation of land drainage schemes - Types and design of surface drainage - Controlling of soil erosion and soil salinity - Estimation of soil loss due to erosion - Universal soil loss equation.

Unit – III

Water Conservation and Harvesting

Types and design of water conservation and water harvesting structures for different types of catchments - Rainwater harvesting - Catchment and roof top harvesting - Harvesting structures - Soil moisture conservation - Check dams - Artificial recharge - Farm ponds - Percolation tanks

Unit – IV

Introduction to River Basins

River systems - Water and river basin management in India - Upstream-downstream demands - Quality problems downstream - Environmental flows - Shared rivers - Water conflict resolution - Requirements for integrated river basin management.

Unit – V

River Basin Management

River basin management - Principles of planning processes - Water availability assessment – Surface water and groundwater - Water demand assessment - Municipal, industrial, agricultural

and environmental - Water allocation - Principles and policies - Case studies - Impacts of anthropogenic activities and climate change on water resources.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Develop technical and socio-economic knowledge available for implementing Watershed successfully.
CO 2:	Identifying Causes of soil erosion.
CO 3:	Plan and design soil conservation measures in a watershed
CO 4:	Plan and design water harvesting and groundwater recharge structures
CO 5:	Plan measures for reclamation of saline soils

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3						3						3	2	
CO 2	3		1	3	1	2	1						3	2	1
CO 3	3	3	3	1	1		2				2	1	3		
CO 4	3	3	3	1	1		3				2	1	3	2	
CO 5	3	1	1	3		3	3				2	1	3	2	2

Textbooks

1. J V S Murthy, "Watershed Management", New Age International Publishers, New Delhi.

Reference Books

1. Ghanshyam Das "Hydrology and Soil Conservation Engineering", Prentice-Hall of India Pvt. Ltd., New Delhi.
2. Suresh R "Soil and Water Conservation Engineering", Standard Publishing Distributors, New Delhi.
3. E M Tideman "Watershed Management", Omega Scientific Publishers, New Delhi.
4. M Newson, "Land, Water and Development: River Basin Systems and Their Sustainable Management", Routledge, London.
5. G J Young, J C I Dooge and J C Rodda, "Global Water Resources Issues", Cambridge University Press, Cambridge, UK.

Course Title	Building Technology					Program & Sem.		B. Tech. &VII
Course Code	Category	Hours/Week			Credits	Maximum Marks		
18OE103	OEC	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- Understand the importance of construction management, resources and stages of Planning
- To know how to prepare scheduling in construction activity. significance of PERT and CPM and make use of these two techniques how to develop a network diagram for construction
- To know various types of equipment in construction and applications mechanisation in construction

UNIT – I

Building Materials-I: Bricks, Stones, Aggregate, Sand, Ordinary and Special Cements, Tiles, Wood, Paints, varnishes.

UNIT – II

Building Materials-II: Reinforced Cement Concrete, Ready Mixed Concrete, High Performance Concrete, Concrete and Mortar Admixtures, I.S.I. Standards and Laboratory Testing of Building Materials.

UNIT – III

Building Structures-I: Types of foundation, Stone masonry, brick masonry. Damp proof course, plinth beam, types of flooring.

UNIT – IV

Building Structures-II: Framed Structures, lintels, arches, sunshades, Types of roofs and roof coverings. Staircases, Form works, door, windows.

UNIT – V

Building Finishes: Plastering, Colour Washing, Distempers, Painting and Varnishing. Water Supply and Sanitary arrangements, Electrification and Weatherproof Courses.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Investigate the various construction materials used the field/industry
CO 2:	Describe different types of concrete mixes along with admixtures
CO 3:	Understand various foundations, floorings, masonry works used in the construction field
CO 4:	Understand concepts on lintels, arches, sunshades and types of roofs and form works
CO 5:	Understand various plastering and painting works, water supply and sanitary arrangements in the building

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1		2	3	3		2	3					3	3		
CO 2	2	3	3	3	2	2	2					3	3		
CO 3	2	3	3	3		2	2					3	3		
CO 4		2	3	3		2	3					3	3		
CO 5	2	2	3	3		2	3					3	3		

Textbooks:

1. Rangwala, "Engineering Materials", Charotar Publishing House, Anand, Gujrat.
2. M S Shetty "Concrete Technology", S. Chand Publishers, New Delhi.

Reference Books:

1. S P Arora & S P Bindra, "Building Construction", Dhanpath Rai and Sons, New Delhi.
2. Sushil Kumar, "Building Construction", Standard Publishers Distributers, New Delhi.

Course Title	Estimating & Costing				Program & Sem.		B. Tech. & VII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
18OE104	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	00	00	02	30	70	100
Mid Exam Duration: 2Hours					End Exam Duration: 3Hours		

Course Objectives:

- To know the importance of preparing the types of estimates under different conditions.
- To know about the rate analysis and bill preparations
- To emphasizes on preparation quantities of item of works with different methods and how to prepare bar bending schedule for structural elements
- To study about the specification writing
- To equip the student with the ability to do rate analysis, valuation of properties.

Unit - I

Introduction to the Estimation of Structures:

Introduction, Different Item of Works – Units of Item of Works – Types of Estimates – Methods of Estimates

UNIT – II

Rate Analysis

Rate Analysis of Different Item of Works: Earthwork Excavation – Mortars of Various Proportions (Cement and Lime) – Concrete with Various Proportions (Lime and Cement) – Brick Masonry – Stone Masonry – Pointing – Painting – Plastering – Aluminum Partitions – Wooden Partitions – Cement Concrete Flooring With 1:2:4 Mix – Ceramic and Vitrified Tile Flooring and Mosaic Flooring.

UNIT – III

Quantity Estimation of Buildings

Estimation of Quantities in Buildings: Load Bearing Wall Structure of Single Room, Double Room and Multi Room.

UNIT – IV

Specifications

Specification of Different Items of Works: Types - Standard Specifications for Different Items of Building Construction – Earth Work for Foundations, Mortars, Foundation Concrete, Reinforced Concrete, Brick Work, Stone Masonry, Mosaic Flooring, Terrazo Flooring, RCC Roof and AC Roof and GI Sheets, Plastering, Painting, Pointing and Wood Works.

UNIT – V

Contracts and Valuation

Contracts: Types of Contracts, Contract Document, Conditions of Contracts, Contract Procedure, Termination of Contracts, Specifications, Important Conditions of Contract, Arbitration and Tenders.

Valuation: Introduction, Technique of Valuation, Elements of Valuation and Factors Affecting Valuation, Methods of Valuation to the Land Property and Building Property, Mortgage.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Apply different types of estimates in different situations
CO 2:	Carry out analysis of rates and bill preparation at different locations.
CO 3:	Expertise the different methods of estimation of various item of work and expertise to prepare bar bending schedule.
CO 4:	Demonstrate the concepts of specification writing
CO 5:	Discuss agreements, contracts, tenders for building construction and carry out valuation of assets

Mapping of Cos with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	3	3		2						2	3		
CO 2	3	3	3	3		2						2	3		
CO 3	3	3	3	3		2						2	3		
CO 4	3	3	3	3		2						2	3		
CO 5	3	3	3	3		2						2	3		

Textbooks:

1. B N Dutta "Estimating and Costing in Civil Engineering", U B S Publishers Distributers. Pvt. Limited, Noida.
2. "Standard Data Book – Vol.2", Andhra Pradesh Department of Standard Specifications, Amaravathi.

References:

1. Dr. Roshan H Namavati "Professional Practice", The Lakhani Book Depot, Mumbai.
2. S C Rangwala "Estimating Costing and Valuation", Charotar Publishing House Pvt. Limited, Anand.
3. Chakraborthi. M, Estimating, Costing, Specification & Valuation in Civil Engineering, UBS Publishers, and distributors, 2006.

Course Title	Water Supply Engineering					Program & Sem.		B. Tech. & VII
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
18OE105	OEC	02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- To import knowledge in water quantity and quality parameters and future demand and forecasts on water
- To study the sources, quality, and standards of water
- To understand various water treatments methods
- To understand the water distribution system from source to destination

UNIT – I

Introduction to Water Supply: Environmental Engineering - Role of Environmental Engineer - Water supply - Development of public water supply - Need for protected water supplies - Objectives of water supply systems - Water supply scheme - Quantity of water - Estimating requirements - Design period – Per Capita Consumption - Fluctuations in demand pattern - population forecast – Arithmetic, Incremental, Geometric methods.

UNIT – II

Sources, Quality and Standards of Water: Sources of water - Surface and ground water sources – Quality of water - Physical, chemical, and biological aspects - Analysis of water - Water quality standards - Impurities in water - Water borne diseases - Drinking water quality standards.

UNIT – III

Treatment of Water: Flowchart of water treatment plant - Treatment methods (Theory and Design) – Sedimentation - Coagulation - Sedimentation with Coagulation – Filtration - Chlorination and other Disinfection methods - Softening of Water – Defluorination - Removal of Odours.

UNIT – IV

Advanced Water Treatments and Management: Principles and functions of Aeration - Iron and manganese removal, Defluorination and demineralization -Water softening - Desalination - Membrane Systems - Recent advances. Sustainable Development - Rainwater harvesting methods - Water Pollution - Causes and effects

UNIT – V

Water Distributions and Plumbing: Distribution systems – Requirements, Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe methods service reservoirs – Joints, valves such as sluice valves, air valves, scour valves and check valves water meters – Laying and testing of pipelines – Pump house, waste detection and prevention, Principles of design of water supply in buildings - House service connection. Water supply – pipes and fittings; House drainage - Sanitary fittings, Traps, Plumbing system of drainage

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	To understand the impact of development of water supply and estimation and design of public water supply.
CO 2:	To interpret the sources, Quality and Standards of drinking water quality standards.
CO 3:	To interpret water treating procedures and design of water treatment methods.
CO 4:	To evaluate the advanced water treatment in removal of harmful constituents and water management.
CO 5:	To evaluate the water distribution techniques and water distribution system, its working and plumbing.

Mapping of Cos with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2					3					2	2		
CO 2	2	2		3			2					2	3		
CO 3	2	2				2					2		3	2	
CO 4		3		2	2	2	2				3		2		
CO 5	2	2		2			3					2	2		

Textbooks:

1. S K Garg, "Environmental Engineering", Vol.1 Khanna Publishers, New Delhi.
2. B C Punmia, Ashok Kumar Jain & Arun Kumar Jain "Water Supply Engineering", Lakshmi Publications, New Delhi.

Reference Books:

1. H S Peavy, D R Rowe and G Tehobanoglous "Environmental Engineering" Tata McGraw-Hill Companies, Inc. New York.
2. S K Hussain "Water Supply and Sanitary Engineering", Oxford & IBH, New Delhi.

Course Title	Construction Practice and Management					Program & Sem.	B. Tech. & VII	
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
18OE106	OEC	02	00	00	02	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- Understand the importance of construction management, resource management and what the stages of construction activity are?
- To know how to prepare scheduling in construction activity. significance of pert and CPM and make use of these two techniques how to develop a network diagram for construction
- To know various types of equipment in construction and their usage in varied works usage of mechanization and its effect on productivity. Applications of machinery in different types of constructions are?
- Understand importance of inspection and how to maintain quality in different stages. Recognize the standards of materials and effective utilization of skilled persons in construction. Effect of ethical procedures in construction.
- To know the importance of safety measures in construction activity, effect of safety benefits to construction workers. Understand the importance of organization and know how to maintain communications in construction.

UNIT – I

Introduction: Significance of Construction Management – Objectives and Functions of Construction Management – Types of Construction – Resources for Construction Industry – Stages of Construction – Construction Team and Engineering Drawings.

UNIT – II

Construction Planning and New Techniques in Construction Management: Stages of Planning – Scheduling, Preparation of Material – Equipment – Labour and Finance Schedules – Bar Charts and Milestone Charts**.** Programme Evaluation Review Technique (PERT) and Critical Path Method (CPM) – Break Down of Structures – Classification of Activities – Rules for Developing Networks – Network Development and Analysis – Critical Activities – Critical Path and Cost Optimization.

UNIT – III

Construction Equipment and Management: Equipment Requirements in Construction Industry, Heavy Earth Moving Equipment – Bulldozers, Scrapers, Loaders Shovels and Cranes – Compaction Equipment, Grading Equipment, Aggregate Production Equipment, Asphalt Mixing Plant and Asphalt Laying Plant, Hauling Equipment, Concrete Mixing Equipment, Material Handling Devices, Pneumatic Equipment, Bridge Construction Equipment, Drilling and Blasting Equipment, Pumping and Dewatering Equipment.

UNIT – IV

Inspection and Quality Control, Ethical Audit: Need for Inspection and Quality Control Principles of Inspection – Enforcement of Specifications – Stages of Inspection and Quality Control. Introduction – Aspects of Project Realization – Ethical Audit Procedures – The Decision Makers – Variety of Interest – Formulation of Briefs – The Audit Statement and Reviews.

UNIT – V

Safety and Risk, Organization of Construction: Introduction on Safety and Risk – Concept and Importance of Safety – Types of Risks – Safety and Engineers – Safety Measures in Construction Work – Design for Safety – Risk Benefit Analysis – Accidents. Principles of Organization – Communication – Leadership and Human Relations – Types of Organizations – Organization for Construction – Temporary Services and Job Layout.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	List the various stages and implementation of management skills in construction.
CO 2:	Possibility usage of sophisticated equipment in construction.
CO 3:	The basic in quality maintains in various stages.
CO 4:	The importance of organization and how correspondence carried out in construing industry.
CO 5:	Know the value of quality and safety in construction.

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1		3	3	3	2						3	2	3		
CO 2	2	3	3	3	2						3	3	3		
CO 3		3	3	2	2	2	2	3			2	3	3		
CO 4		2	2	3		2						2	3		
CO 5		3	3	3		3	2					3	3		

Textbooks:

1. P S Gahlot and B M Dhir "Engineering Construction Planning and Management", New Age International (P) Limited, Publishers, New Delhi.
2. S C Sharma "Construction Equipment and Its Management", Khanna Publishers, New Delhi.

Reference Books:

1. M Govindarajan, S Natarajan and V S Senthilkumar "Engineering Ethics", Prentice-Hall of India (P) Limited, New Delhi.
2. Dr. S Seetharaman "Construction Engineering and Management", Umesh Publications, New Delhi.
3. Horpal Singh "Construction Management and Accounts", Tata McGraw-Hill Companies, Inc. New York.

VIII Semester
Syllabus

Course Title	Repairs & Rehabilitation of Structures				Program & Sem.	B. Tech. & VIII	
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1801801	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours		

Course Objectives:

- To expose the students to understand types, mechanism of deterioration of structures.
- To make the student able to understand different types of repairs and materials selection for repairs.
- To make the student able to perform the structural assessment using different methods/techniques.
- To make student to explain the significance of retrofitting for structures.
- To make student to develop diverse knowledge of maintenance and structural health monitoring.

UNIT – I

Introduction: Deterioration of Structures, symptoms & causes, Mechanism of deterioration, Factors affecting deterioration. Types of deterioration, Physical deterioration due to moisture, temperature, shrinkage, freeze-thaw, crystallization of salts, Efflorescence, marine exposure. Chemical deterioration due to corrosion of reinforcement (chloride, carbonation induced), Alkali-silica reaction, sulphate, and Acid attack.

UNIT – II

Repair Materials - Criteria for durable concrete repair, Methodology, selection of repair materials, Preparatory stage of repairs, Different types of repair materials & their application, types of repair techniques, Repairs in under water structures, Geniting, shotcrete, underpinning.

UNIT – III

Structural Assessment: Structural Appraisal of the structure, importance, objective & stages, Conditional/damage assessment procedure, Preliminary & Detailed investigation, Scope, Objectives, Methodology & Rapid visual inspection of structures, and different non-destructive techniques to evaluate deteriorations.

UNIT – IV

Retrofitting: Need for retrofitting, Design philosophy of strengthening structures, Techniques available for strengthening including conventional and advanced techniques.

Seismic retrofit of concrete structures: Deficiencies in structure requiring seismic retrofit, Design philosophy, Techniques to enhance the seismic resistance of structures, advanced techniques for making seismic resistant structures.

UNIT – V

Protection & Maintenance of Structures

Importance of protection & maintenance, Categories of maintenance, Building maintenance. Corrosion mitigation techniques to protect the structure from corrosion.

Structural health monitoring (SHM) – Definition and motivation for SHM, Basic components of SHM and its working mechanism, SHM as a tool for proactive maintenance of structures, uses of sensors.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Understand various types of deterioration and its causes & effects.
CO 2:	Select methods and techniques used in repairing / strengthening existing concrete structures.
CO 3:	Create assessment reports for detailed investigations of deteriorated structures.
CO 4:	Adopt different retrofitting techniques
CO 5:	Assess the health condition of structures using different techniques

Mapping of Cos with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2		2								3		
CO 2	3	2	3		3								3		
CO 3	3	2	2		3								3		
CO 4	3	2	3		3								3		
CO 5	3	2	3		3								3		

Textbooks

1. Varghese.P.C "Maintenance Repair and Rehabilitation and Minor Works of Building", Prentice Hall India Pvt. Ltd 2014.
2. Ravishankar. K. Krishnamoorthy. T. S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.

Reference Books

1. Handbook on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
2. Diagnosis and treatment of Structures in Distress – R N Raikar,1994
3. R T. Allen and S.C. Edwards, Repair of concrete Structures, Blakie and sons, UK, 1987

Course Title	Bridge Engineering					Program & Sem.		B. Tech. /VII
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
1801803	PEC 4	02	01	00	03	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- Bridges and its components- different types of loadings and IRC classification of loadings and its importance
- Bridges and box culverts and its design procedure.
- Bridge bearings and its importance and plate girder bridges and its design procedure.

Unit - I

Introduction- Importance of Site Investigation in Bridge Design – Highway Bridge Loading Standards – Impact Factor – Railway Bridge Loading Standards (B.G & M G Bridges) – Various Loads in Bridges.

Unit – II

Box Culvert -Box Culvert: General Aspects – Design Loads – Design of Box Culvert Subjected to R C Class AA Tracked Vehicles only.

Unit - III

Design of Deck Slab Bridge-General Features – Effective Width Method of Analysis Design of Deck Slab Bridge (Simply Supported) subjected to Class AA Tracked Vehicles only.

Unit - IV

Design of T-Beam Bridge- General Features – Design of Interior Panel of Slab – Pigeaud's Method – Design of a T- Beam Bridge Subjected to Class AA Tracked Vehicles only.

Unit – V

Piers, Abutments and Bridge Bearings-General Features – Bed Block – Material Piers & Abutments – Types of Piers – Forces Acting on the 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)

Bridge Bearings: General Features – Types of Bearings – Design Principles of Rocker & Roller Bearings – Design of Steel Rocker Bearings – Design of Elastomeric Pad Bearings

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Students are effectively learned the bridges; its components and various loads are acting on the bridge structure.
CO 2:	Students understand the analysis & Design of square box culvert easily
CO 3:	Student effectively analyze and design the deck slab bridge according to IRC codes
CO 4:	Students known about analysis & design of T-beam bridge and subjected to loading of class 'AA' tracked vehicles
CO 5:	Students develop the knowledge about piers and abutment of bridges, various forces acting on it and different types of bridge foundations. Also known about the design principles of bridge bearings

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	2	1	1									1		
CO 2	3	3	3	2	1								3		1
CO 3	3	3	3	2	1								3		1
CO 4	3	3	3	2	1								3		1
CO 5	2	3	3	2									3		1

Textbooks

1.S Ponnuswamy "Bridge Engineering", Tata McGraw-Hill Companies, Inc. New York.
2.N Krishna Raju "Design of Bridges", Oxford & IBH Publishing Company (P) Limited, New Delhi.
3.D Johnson Victor "Essentials of Bridge Engineering", Oxford & IBH Publishing Company (P) Limited, New Delhi.

Reference books / IS Codes / IRC Codes

1.IS 800-2007 "Indian Standard Code of Practice for General Construction in Steel", Bureau of Indian Standards, New Delhi.
2.IS 456-2000 "Indian Standard Plain and Reinforced Concrete – Code of Practice", Bureau of Indian Standards, New Delhi.
3.IRC 6-2000 "Standard Specifications and Code of Practice for Different Types of Loadings Acting on the Bridge Structure", The Indian Roads Congress, New Delhi.
4.IRC 22-2000 "Standard Specifications and Code of Practice for Road Bridges and Different Materials used in Bridge Structures and Reinforcement Details", The Indian Road Congress, New Delhi.
5.IRC 24-2000 "Standard Specifications and Code of Practice for Permissible Bending Stresses in Steel and its Properties", The Indian Road Congress, New Delhi.
6.IRC 83-2000 "Standard Specifications and Code of Practice for Different Types of Bridge Bearings used in the Bridges and its Detailed Specifications", The Indian Road Congress, New Delhi.

Course Title	Finite Element Method				Program & Sem.	B. Tech. & VII	
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801804	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	01	00	03	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours		

Course Objectives:
To understand the concepts of Finite element methods to analyze critical stress conditions in structures.

Unit - I
Introduction to Finite Element Method- Introduction - Finite Difference Method - Advantages and Disadvantages - Basic Steps – Limitations - Finite Element Modelling and Discretization - Types of Elements - Nodes and Degrees of Freedom - Interpolation and Shape Functions

Unit – II
One Dimensional & Two-Dimensional Elements- Stiffness matrix for bar element – shape functions for one dimensional element – one dimensional problem. Two Dimensional Elements - Different types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

Unit - III
Trusses-Plane Trusses - Local and Global Coordinate Systems - Direction Cosines - Element Stiffness Matrix - Assembly of Global Stiffness Matrix - Stress Calculation.

Unit - IV
Beams- Introduction Beam Stiffness - Assembly of Beam Stiffness Matrix – Loading - Boundary Conditions - Plane Stress - Plane Strain Analysis

Unit - V
Iso-parametric Elements and Finite Element Modelling- Mesh Requirements - Material Properties - Loads and Reactions - Boundary Conditions - Checking the Model - Analysis and Design Software (For Practice Purpose Only)
Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

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

CO 1:	Understanding of the fundamental theory of the FEM
CO 2:	Demonstrate the differential equilibrium equations and their relationship
CO 3:	Demonstrate the displacement models and load vectors
CO 4:	Understand the use of the basic finite elements for structural applications using truss, beam, frame, and plate elements.
CO 5:	compute the stiffness matrix for isoperimetric elements and develop suitable software tools for analysis purpose

Mapping of Cos with POs and PEOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 12	PO 12	PEO 1	PEO 2	PEO 3
CO 1	2	3	2	1	1							2	1		1
CO 2	3	2	2	1	3							3	1		1
CO 3	2	3	3	3	3							3	1		3
CO 4	2	3	3	3	3							3	3		3
CO 5	2	3	3	3	3							3	3		3

Textbooks:

1.Daryl L Logan "A First Course in the Finite Element Method", Cengage Learning India Private Limited, New Delhi.

2.S S Bhavikatti "Finite Element Analysis", New Age International (P) Limited, Publishers, New Delhi.

Reference books:

1.Robert D Cook, David S Malkus and Michael E Plesha "Concepts and Applications of Finite Element Analysis", Wiley India Pvt. Limited, New Delhi.

2.George R Buchanan "Theory and Problems of Finite Element Analysis", Tata McGraw-Hill Companies, Inc. New York.

Course Title	Environmental Geotechnology					Program & Sem.	B.Tech. & VIII	
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
1801805	PEC 4	02	01	00	03	30	70	100
Mid Exam Duration: 02.00 Hrs						End Exam Duration: 03.00 Hrs		

Course Objectives:

- To make the students to learn the concepts of geoenvironmental engineering, planning and design of waste in landfills, ash ponds and tailing ponds.
- To make the students to understand the effects of pollutants on soil properties
- To give awareness about the adverse effects of soil and ground water contaminants
- To analyze and apply various techniques for remediation of the contaminants
- To make the student to understand the reuse of waste materials in geotechnical constructions.

UNIT – I

Introduction: Industrialization and Urbanization, Pollution, Control, and remediation.

Contamination: Surface contamination, Contamination transport, Soil-a Geotechnical trap, Effect of subsurface contamination, Detection of polluted zone, Monitoring and Effectiveness of designed facilities.

UNIT – II

Contaminants of Solid Waste in Landfills: Waste contaminants, landfills, types, shape, and size of landfills. Liner and liner system, Cover and cover system, Stability of landfills. Landfill construction & operation, sustainable waste management.

UNIT – III

Contaminants of Slurry wastes: Slurry transported wastes, slurry ponds, operation, Embankment construction and raising, Design aspects, Environmental Impact, and control.

UNIT – IV

Vertical Barriers for Contaminant: Contaminated sites, Types of barriers, Soil-Bentonite slurry trench walls, Cement-Bentonite slurry trench walls, construction, material, and design aspects.

UNIT – V

Geotechnical Reuse of Waste materials: Waste reduction, use in geotechnical construction, waste characteristics, transportation consideration, engineering properties of Wastes, Waste material in Embankment and Fills.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Understand the different types of contaminants and their effects on subsurface soils
CO 2:	Understand the waste contaminants and design the landfill
CO 3:	Understand the environmental impacts due to the contaminants of slurry waste
CO 4:	Adopt the type of barriers to protect the earth from different contaminants
CO 5:	Understand the engineering properties of the waste material and reuse in the construction

Mapping of Cos with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	2	3		2	3					2	1	3	
CO 2	2	2	3			2		1					3	2	
CO 3	2	1	2	2		1	2	1				2	2	2	
CO 4	2	2	2	2		1	2	1					2	2	
CO 5	2	1	1	2		1	2	1					2	2	

Textbooks:

1. Lakshmi N. Reddi and Hilary I. Inyang, "Geoenvironmental Engineering: Principles and Applications", CRC Press, United States.
2. Hari D. Sharma and Krishna R. Reddy, "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies", John Wiley and Sons, Inc., United States.

Reference Books:

1. David E. Daniel, "Geotechnical Practice for Waste Disposal", Chapman & Hall, Springer Publishers, Germany.
2. Rowe R. Kerry, "Geotechnical and Geoenvironmental Engineering Handbook", Springer Publishers, Germany.
3. Proceedings of the International symposium of Environmental Geotechnology (Vol. I and II), Environmental Publishing Company, 1986 and 1989.
4. ASTM Special Technical Publication 874, Hydraulic Barrier in Soil and Rock, 1985.

Course Title	Urban Transportation Planning				Program & Sem.		B. Tech. & VIII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801806	PEC 4	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	01	00	03	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours		

Course Objectives:

- To study the need of urban transportation planning system.
- To understand different types of transportation surveys.
- To study the process of trip generation and distribution.
- To understand model split and factors affecting it.
- To study the transportation plan preparation for different transit systems

UNIT – I

Urban Transportation System Planning: Role of transportation in urban development - Transportation problems in urban areas - Purpose of transportation planning - Transportation planning process and factors affecting it - Travel demand and actors affecting it - Urban transport forecasting

UNIT – II

Transportation Surveys: Study area and zoning - Survey Types: Home interview surveys - Commercial vehicle surveys - Taxi surveys - Road side interview surveys - Post card questionnaire surveys - Registration number surveys - Tag surveys - Public transport surveys - Telephone surveys - Inventory of existing transport facilities.

UNIT – III

Trip Generation and Distribution: Trip generation: Trip purpose, Problems of trip generation - Factors governing trip generation and attraction rates - Trip distribution 3.4 Methods of trip distribution: Uniform factor - Average factor – Detroit – Fratar - Furness and Time factor method - Problems based on trip distribution

UNIT – IV

Modal Split: Modal split in the transport process planning problem and factors affecting modal split - Trip Characteristics in urban areas: Household characteristics, Zonal characteristics, Network characteristics

UNIT – V

Transportation Plan Preparation: Definitions: corridor, corridor traffic forecasting, corridor traffic study, count, segment, point, segment capacity, screen line - Corridor identification - Mass transit system - Urban mass rapid transit system - Rail based transit – Metro, Light rail transit system (LRT), Monorail, Sky rail - Road based transit – Bus rapid transit system (BRTS), Electric trolley bus, commuter Bus / City Bus.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Justify the need for urban transportation system planning.
CO 2:	Undertake transport surveys followed by a report.
CO 3:	Plan the process of trip generation and distribution.
CO 4:	Justify the need of a modal split.
CO 5:	Prepare the transportation plans for urban mass rapid transit systems.

Mapping of COs with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1		3		3		3	3			2		3	3		
CO 2	3	3	3	3	2		1		2	1		2	3		
CO 3	3	3	3	2			2					3	3		
CO 4	3	3	3	3			2		1			2	3		
CO 5	3	3	3	3	2	2	3		1	2		3	3		

Textbooks:

1. Kadiyali. L. R. "Traffic Engineering and Transportation Planning", Khanna Publishers, New Delhi.
2. Hutchinson, B. G "Introduction to Urban System Planning", McGraw Hill.

References:

1. Khisty C. J. "Transportation Engineering-An Introduction", Prentice Hall.
2. Papacostas "Fundamentals of Transportation Planning", Tata McGraw Hill.

Course Title	Design and Drawing of Irrigation Structures				Program & Sem.		B. Tech. & VIII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1801807	PEC4	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	01	00	03	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours			

Course Objectives:

- To study the preliminary and secondary investigations required for hydraulic structures.
- To study the different methods for estimating of peak flow.
- To study in detail design procedures and their site-specific criteria.
- To study the different safety measures required for during operations of irrigation structures.

UNIT-I

Design of surplus Weir: Introduction – Estimation of Flood Discharge – Selection of type of Work – Length of Surplus Weir – Crest Width Base Width – Abutments – Wings Returns – Aprons.

UNIT – II

Canal Drop (Notch Type): Trapezoidal Notch Length of Drop Wall Between Abutments – Profile of Drop Wall – Notch Pier – Protective Works.

UNIT – III

Tank Sluice with Tower Head: Vent Way Design – Sluice Barrel Tower Head – R.C Slab – Earth Pressure – Stability Analysis – Tower Head Design – Cistern.

UNIT – IV

Canal Regulator cum Road Bridge: Vent Way Design – Drowning Ratio Method – Roadway – Piers Shutters, Abutments – Wing Walls – Return Walls – Return Walls – Solid Apron for Regulator – Revetments – Energy Dissipation.

UNIT – V

Under Tunnel: Design of Barrel Roof – Abutments Pressure Under Pier – Fixing Maximum Flood Levels Rail Channel – Afflux over Drop Wall – Loss of Head Calculation – Depth of Foundation Return Walls – Wing Walls and Return – Uplift – Creep Lost in Percolation.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Gain knowledge and use or apply theory / design principles of surplus weir works.
CO 2:	Understand the importance and easily recognize the structure in broadest context of canal drop works.
CO 3:	Apply engineering fundamentals in stability and analysis of tower head design.
CO 4:	Compute the stresses and stability analysis of canal regulation arrangements.
CO 5:	Design of outlet structures and drop structures based on different filed conditions.

Mapping of Cos with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3			1		2	2					3	3		
CO 2	3	3	2	2						3		3	3	2	
CO 3	3	3	3									3	3	2	
CO 4	3	3	3	3								3	3		
CO 5	3	3	3							2		3	3		

Textbooks:

1. C Satyanarayana Murty "Water Resources Engineering – Principles and Practice", New Age International (P) Limited, Publishers, New Delhi.

References:

1. Santosh Kumar Garg "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi.
2. N Balasubramanya "Hydraulic Structures and Irrigation Design Drawing", Sapna Book House and Publishers, Bangalore.

Course Title	Disaster Preparedness				Program & Sem.		B. Tech. & VIII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
18OE107	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours		

Course Objectives:

- To Understand basic concepts in Disaster Management
- To Understand Definitions and Terminologies used in Disaster Management
- To Understand Types and Categories of Disasters
- To Understand the Challenges posed by Disasters
- To understand Impacts of Disasters Key Skills

Unit - I

Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation.

Unit - II

Disasters – Disasters' classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit - III

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Unit - IV

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief, and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); sustainable and environmentally friendly recovery; reconstruction and development methods.

Unit - V

Environment and Development - Roles and responsibilities of government, community, local institutions, NGOs, and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Know the fragile ecosystem and the types of the disasters
CO 2:	Acquire the preparedness and the responsibilities of different agencies on Disaster.
CO 3:	Understand the rescue, rehabilitation, and reconstruction process of disaster management
CO 4:	Understand the disaster response and relief measures
CO 5:	Understand the concepts of vulnerability reduction

Mapping of COs with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1			3	2			3					2	3		
CO 2		3	3	3	2	3	3					2	3	1	
CO 3	2	3	3	3	2	3	3					3	3		
CO 4	2	3	3	3	2	3	3					3	3		
CO 5	2	3	3	3	2	2	3					3	3	3	

Textbooks:

1.Pradeep Sahni and Madhavi Ariyabandu, "Disaster Risk Reduction in South Asia", PHI Learning Pvt. Ltd., Delhi.

2.B. K. Singh, "Handbook of Disaster Management: Techniques and Guidelines", Rajat Publications, Delhi.

Reference Books

1.G. K. Ghosh, "Disaster Management", APH Publishing Corporation, New Delhi.

2.http://ndma.gov.in/ (Home page of National Disaster Management Authority.

3.http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

4.Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.

5.Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.

Course Title	Rehabilitation of Structures				Program & Sem.		B. Tech. & VIII
Course Code	Category	Hours/Week		Credits	Maximum Marks		
18OE108	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		02	00	00	02	30	70	100
Mid Exam Duration: 2 Hours					End Exam Duration: 3 Hours		

Course Objectives:

- To impart knowledge on the distress in structures.
- Understand the basic concepts of deterioration of structures.
- Understand the serviceability and durability aspect of structures.
- Learning the materials used for retrofitting technique.

UNIT – I

General: Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.

UNIT – II

Damage Assessment: Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive, and semi destructive testing systems.

UNIT – III

Influence on Serviceability and Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection.

UNIT – IV

Maintenance and Retrofitting Techniques: Definitions: Maintenance, Facts of Maintenance, and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, externally bonding (ERB) technique, near surface mounted (NSM) technique, External post- tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building.

UNIT – V

Materials for Repair and Retrofitting: Artificial fibre reinforced polymer like CFRP, GFRP, AFRP and natural fibre like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

Course Outcome:

By performing the various tests in this laboratory, the student will be able to

CO 1:	Understand the cause of deterioration of concrete structures.
CO 2:	Able to assess the damage for different type of structures.
CO 3:	Summarize the principles of repair and rehabilitation of structures.
CO 4:	Recognize ideal material for different repair and retrofitting technique.
CO 5:	Know the artificial polymers and rust eliminators used for retrofitting works.

Mapping of Cos with POs and PSOs:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2					1							2		
CO 2	2	2	2		3	1							2		
CO 3	2	2	2		3	2						2	2		
CO 4	3	2	2		3	2						2	2		
CO 5	3	2	2			2	1					2	3		

Textbooks:

1.Sidney, M. Johnson, "Deterioration, Maintenance and Repair of Structures"

2.Denison Campbell, Allen & Harold Roper, "Concrete Structures – Materials, Maintenance and Repair"- Longman Scientific and Technical.

Reference Books:

1.R. T. Allen and S.C. Edwards, "Repair of Concrete Structures"-Blakie and Sons Raiker R.N., "Learning for failure from Deficiencies in Design, Construction and Service"- R&D Center (SDCPL).

2.M. S. Shetty, Concrete Technology – Theory and Practice, S. Chand & Co. Ltd., New Delhi.

Course Title	Organizational Behaviour					Program & Sem.		B.Tech. & VIII
Course Code	Category	L	T	P	Credits	Maximum Marks		
						Continuous Internal Assessment	End Exam	Total
	MC 3	02	00	00	00	30	-	30
Mid Exam Duration: 02.00 Hrs.								

Course Objectives:

- To provide a basic knowledge of main ideas and key theories relating to organizational behaviour.
- To provide an understanding of the behaviour of individuals and groups inside the organization using theoretical framework.
- To develop critical analytical skills that will help in diagnosing problems in the organization, assess strengths and weaknesses, and generate effective solutions to the problems.
- To facilitate a critical evaluation of organizational practices and their impact on work behaviours, attitudes, and performance.

UNIT – I

Introduction: Definition, Need for and Importance of organizational behaviour – Nature and scope –Framework – Organizational behavior models.

UNIT – II

Individual Behaviour: Personality – types –Theories – Learning – Types of learning – The learning process – Learning theories – Misbehaviour – Types – Emotions - Emotional Labour – Emotional Intelligence – Theories; Attitudes – Characteristics – Perceptions – Importance – Factors influencing perception – Interpersonal perception - Impression Management; Motivation – importance – Types – Theories - Effects on work behavior.

UNIT – III

Group Behaviour: Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.

UNIT – IV

Leadership and Power: Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centres – Power and Politics.

UNIT – V

Dynamics of Organizational Behaviour: Organizational culture and climate – Factors affecting organizational climate – Importance; Job satisfaction – Determinants – Measurements – Influence on behavior; Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life.

Course Outcomes:

On completion of the course, the student will be able to:

CO 1:	Remembering basic knowledge in concepts and theories of organizational behavior
CO 2:	Understanding of the behavior of individuals and groups decision making and team building techniques towards interpersonal relations
CO 3:	Applying concepts, laws, methods, required skills in leadership and develop power cent
CO 4:	Recognize culture and climate to change work and life
CO 5:	Apply the principles and concepts in balancing of work and life

Mapping of Cos with POs and PSOs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1						2		1	3	1	2		3		
CO 2						2		1	3	2	2		3		
CO 3						3		2	3	3	2		3		
CO 4						2		1	2	1			2		
CO 5						3		3	3	1			1		

Textbooks

1. Stephen P. Robins (2008) "Organizational Behaviour" (11th Edition), Prentice Hall of India, New Delhi.
2. Fred Luthans (2001). "Organizational Behaviour" (11th Edition), Tata McGraw-Hill Companies, Inc. New York.
3. Subbarao. P, "Management and Organizational Behaviour". Prentice Hall of India, New Delhi.

Reference Books:

1. Schermerhorn, Hunt and Osborn (2008). "Organizational Behaviour" (9th Edition). John Wiley.
2. Udai Pareek (2004). "Understanding Organizational Behaviour" (2nd Edition). Oxford Higher Education.