S. Y. B. Tech – Sem. III

Course Code	Course	Teaching Scheme				Scheme	Evaluation Scheme				
		L	T	P	Cr		Theory (Marks %)			Practical (Marks %)	
							Max.	Min. for passing		Max.	Min. for passing
SH2051	Engineering Mathematics –III	3	-	-	3	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2011	Strength of Materials	3	-	-	3	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2031	Surveying	3	-	-	3	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2151	Building Construction and Planning	2	-	-	2	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE 2219	Environmental Science	2	-	-	2	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE 2071	Strength of Materials Lab.	-	-	2	1	ISE	-	-	-	100	50
CE 2091	Surveying Lab	--	-	4	2	ISE	-	-	-	50	50
						ESE	-	-	-	50	50
CE 2111	Building Construction and Planning Lab	--	-	4	2	ISE	-	-	-	50	50
						ESE	-	-	-	50	50
CE 2131	Programming Skills	1	-	2	2	ISE	-	-	-	100	50
CE2151	Mini Project	-	-	2	2	ISE	-	-	-	100	50
SH254/ 255/256/ 257/258	Professional Skill Development I (Choice Based)	--	--	2	1	ISE	-	-	-	50	50
						ESE	-	-	-	50	50
	TOTAL	14	-	16	23						

Total Contact Hours/week : 30
Total Credits : 23

4

S.Y B. Tech. Civil Engineering – Sem. - III
SH 2051: Engineering Mathematics III

Teaching Scheme				Evaluation Scheme					
				Scheme	Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits		Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

Engineering Mathematics – III is offered as the core science course at the third semester of second year of four year engineering degree course; containing six modules. The Modules involved in the Course are linear differential equations, applications of linear differential equations to civil engineering, linear partial differential equations with constant coefficient, Fourier series, statistics and probability distribution. This course intends to build the competency in the students to apply the concepts learnt in respective modules to various Civil engineering Problems.

Course Outcomes:

1. After successful completion of this course students should be able to:
2. Acquire and apply basic knowledge of basic mathematical fundamentals
3. Calculate deflection of beams with application of linear differential equations.
4. Apply Fourier series to Civil engineering problems.
5. Demonstrate random variable and probability distribution.

Pre-requisite:

1. Differential equations
2. Functions of two or more variables
3. Partial differentiation and partial differential equations.
4. Elementary probability theory.

Unit wise syllabus:

1. Linear Differential Equations   6 hrs.

Introduction and definition , complete solution of Linear Differential Equations with constant coefficients, complete solution of Linear Differential Equations with variable coefficients

2. Application of Linear Differential Equations to Civil Engineering   6 hrs.
Application to: Deflection of Beam, Cantilever Struts.

3. Linear Partial Differential Equations with constant coefficients   6 hrs.
Introduction and Definition , Linear homogeneous partial Differential Equations of nth order with constant coefficients , Methods of solutions of Linear homogeneous Partial Differential Equations of nth order with constant coefficients , Non-homogeneous Linear Equations.

4. Fourier Series   6 hrs.
Definition, Euler's Formulae, Expansions of functions, Change of interval, Even and odd function, Half range sine and cosine series.

5. Statistics   6 hrs.
Coefficient of correlation, Lines of regression of bi variate Data, fitting of curves (lines and parabola) by least square principle.

6. Probability Distribution   6 hrs.
Random Variable, Discrete and continuous Probability Distributions, Binomial, Poisson and Normal Distributions.

Text Books:
1. Dr. B. S. Grewal, Higher Engineering Mathematics, 39th edition, Khanna Publications, New Delhi, 2005.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern, 9th edition, 2011

Reference Books:
1. N. P. Bali, Ashok Saxena and N. Ch. S. N. Iyengar "A Text Book of Engineering Mathematics", Laxmi Publications, New Delhi, 6th edition, 2004.
2. Peter V. O'Neil "Advanced Engineering Mathematics", Cole publishing house, 4th edition, 2002.
3. P. N. Wartikar and J. N. Wartikar "A Text book of Applied Mathematics", Vol. I, Vol. II, Vidyarthi Griha Prakashan, Pune. 9th Revised edition, October 1984, Reprints: September 2005.

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

Strength of Material is one of the core courses offered at third semester of Civil Engineering undergraduate programme and it comprises of six units. Structural Engineering is one of the important branches of Civil Engineering. It deals with the design of various structures. The design of any structure or structural element is not possible unless all the forces and corresponding stresses induced in the structure are known. The analysis of structure includes determination of all the forces acting on a structural element and finding the corresponding stresses induced. Thus for design of any structural element analysis is the first stage. This course, 'Strength of Material' deals with the analysis of various determinate structures, such as beams, columns and trusses. This will help the students to analyze and design different structural elements.

Course Outcomes:

After successful completion of this course students should be able to :
1. Determine & demonstrate strength & behavior of material under axial shear and bending forces.
2. Calculate various types of load.
3. Construct and calculate shear force and bending moment diagrams & shear and bending stresses for different beam sections for given loading and support conditions.
4. Compute principal stresses and strains for a strained material.
5. Calculate combined direct and bending stresses in the various structural elements.
6. Compute safe axial load on columns with different end conditions.

Prerequisites:

For studying this course the student should have studied the courses Engineering Mechanics and Physics. The knowledge of Engineering Mechanics will help to identify different types of loads, preparing free body diagrams and finding support reactions. The knowledge of Strength of Materials will help them to determine, stresses and strains due to axial loadings, shear force and bending moment at various sections of beams, shear and bending stresses in the various beam sections. The knowledge of basic mathematics and trigonometry is also required.

Unit wise syllabus:

Unit: 1   Basic concepts of stress and strains   (6)
Concept of stress and strain, Hook"s law, Stress-Strain diagrams for brittle, elastic and plastic materials, Deformations in composite sections under axial loading, compound bars, and temperature stresses.

Unit: 2   Elastic Constants   (6)
Simple and Complementary shear stress, Poisson"s ratio, Normal stresses and strains in three dimensions, Elastic constants and their relationships.

Unit: 3   Shear force and bending moment diagram   (6)
Concept of shear force and bending moment for simple and compound beams. Relation between shear force, bending moment and loading. Shear force and bending moment diagrams for various beams and loadings.

Unit: 4   Bending and shear stresses   (6)
a) Bending Stresses: Theory of simple/pure bending. Derivation for flexure formula. Bending stress distribution diagrams. Moment of Resistance, Flitched beams.
b) Shear Stresses: Derivation of shear stress equation, Shear stress distribution of various cross-sections, average and maximum shear stress.

Unit: 5   Principal stresses and strains   (6)
Principal stresses and strains: Concept of principal planes and principal stresses, normal and shear stresses on an oblique plane, magnitude and orientation of principal stresses and maximum shear stress. Mohr's circle for plane stresses.

Unit: 6   Combined direct and bending stresses   (6)
Combined direct and bending stresses, eccentric load on short columns, kern of a section, eccentricity of load about both axes of section. Chimney subjected to wind pressure, simple problems on dams and retaining walls.

Reference Books:

1. Dr.Shah, H. J. and Junnarkar S.B. "Mechanics of Structures", Charotar Publishing House Pvt Limited, New Delhi, 27th Edition (2007).
2. Khurmi, R.S. "Strength of Materials", Chand (S.) & Co Ltd, India, 2015.
3. Ramamrutham, S. "Strength of Materials", Dhanpat Rai Publishing Company (P) Limited, New Delhi, (2012).
4. Vaidyanathan, R., Perumal, P., Lingeswari, S. "Mechanics of Solids and Structures", Scitech Publications Pvt. Ltd., Chennai, Vol. I (2012).

S.Y B. Tech. Civil Engineering – Sem. - III
CE 2031: Surveying

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:
Before starting of any Civil Engineering project, surveying knowledge is very essential to a Civil Engineer. Surveying is offered as the course in the first semester of second year engineering consists of two modules, the first module focuses on the Temporary and permanent Adjustments in leveling, Reciprocal, Profile Levelling and Cross sectioning, Methods of Plotting Contours, Plane table techniques, Calculation of earthwork in cutting and embankment for civil engineering works. The second module focuses on Theodolite traversing and EDM measurements, Tachometry and Layout surveys, hydrographic surveying techniques and Curve surveying.

Course Outcomes:
After successful completion of this course students should be able to :
1. Apply the surveying principles for completion various civil engineering projects.
2. Calculate reduced levels and contour maps.
3. Prepare the maps for various surveying areas by using the theodolite traverse concept.
4. Use Plane table techniques and its accessories for traversing.
5. Design and Set out the curve on field.
6. Illustrate the principles of advanced EDM instruments.

Prerequisites:
Knowledge of trigonometry and geometry, basic information of linear and angular measurements.

Unit wise syllabus:
Unit: 1   Levelling and Plane table survey   (6 Hrs.)
Level, Types and Terms, Methods of leveling (Reciprocal Leveling - Profile Leveling and Cross sectioning) – Adjustments Temporary and permanent- Curvature and Refraction -
Contouring, Characteristics of Contours - Methods of Plotting Contours - Uses of Contour Maps, Plane table and its accessories - Methods, Advantages and disadvantages of plane tabling.

Unit: 2   Theodolite Surveying   (6Hrs.)

Introduction, types of Theodolite, Field operations with theodolite - Measurement of Horizontal and Vertical Angles - Method of Repetition and Reiteration – Theodolite Traverse - adjustment of closed traverse by transit rule and Bowditch's rule, Gale's Traverse Table.

Unit: 3   Tacheometry and trigonometric surveying   (6 Hrs.)

General principles of stadia system, fixed and movable hair methods, inclined sights with staff held vertically, determination of tachometric constants, analytic lens, field work, Trigonometric Leveling use and application- Find distance and R.L. by Single and Double Plane Methods

Unit: 4   Curve surveying   (6 Hrs.)

Types and use of curves, Super elavation, elements of curve, different methods of setting out-simple circular curves, compound curves, reverse curves, transition curves, types of transition curves.

Unit: 5   Construction and hydrographic surveying   (6 Hrs.)

Horizontal and vertical controls for buildings, positioning of structure, setting out of buildings, bridges and culverts, alignment of tunnels.

Hydrographic surveying-soundings, its equipments and procedure, River surveying.

Unit: 6   EDM & Total Station   (6Hrs.)

EDM instruments, Total station -working and operating Principle, phase correction technique, modulation –Components, Data observations, Accuracy, handling Precautions, Set up of T.S. Application-Generation of property maps by T.S. data transformation with post processing software's

Text Books:

1. Dr. B.C. Punmia, "Surveying Vol. I, II and III" - Laxmi Publishers. New Delhi, Surveying Vol. I, II and III, New edition, 2014.
2. Prof. T.P Kanetkar and S.V Kulkarni, "Surveying and Levelling Vol. I and II", Pune Vidhyarthi Gruh, New edition, 2010
3. Dr. K.R. Arora, "Surveying Vol. I, II and III" - Standard Book House. New Delhi.
4. S. K. Duggal, "Surveying Vol. I and II" -, Tata McGraw Hill, New Delhi.
5. N.N. Basak, "Surveying and Levelling" - Tata Mcgraw Hill, New Delhi.
6. R. Agor, Khanna Surveying and Levelling - Publishers, New Delhi.
7. Dr.A M Chandra, "Plane surveying", New Age Publisher.

Reference Books:

1. James M. Anderson, Edward M. Mikhail, "Introduction to Surveying" by Published by McGraw-Hill Companies.
2. David Clark, "Plane and Geodetic Surveying for Engineer Vol. 2", CBS; 6th Edition 2004.

10

S.Y B. Tech. Civil Engineering – Sem. - III
CE 2151: Building Construction and Planning

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
2	--	--	2	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

This course will integrate your knowledge and understanding of fundamentals of construction technology and processes. Specifically, this course emphasises the role of materials, methods, techniques and sequencing in the construction of buildings. Through your critical engagement in case studies you will consider the environmental impact of construction processes. Your developed knowledge of construction processes will include understanding the role of planning and scheduling in the effective management of construction resources.

Course Outcomes:
After successful completion of this course students should be able to :
1. Prepare drawings of various building components using AutoCAD software
2. Design the components of the building for the given dimensional requirements
3. Choose the site for construction of a residential buildings by following the selection criteria
4. Explain the principles of planning of residential buildings
5. Illustrate the concepts of plumbing and drainage plan
6. Describe the procedures of applying various building finishes

Prerequisites:
Basic Civil Engineering

Unit wise Syllabus:

Unit 1: Introduction to building drawings, structures and Materials.   **4 hrs**

Introduction and necessity of building drawings, Types of building drawings-layout plan, site plan, submission drawing and working drawings, Conventional signs and symbols. Use and properties of the building materials: stone, brick, aggregates, steel, cement, admixtures, roofing materials, flooring materials, timber, aluminum. Concept of mortar, PCC, RCC, introduction to pre-stress concrete and ready mix concrete.

Unit 2: Components of Building (I)   4 hrs

Components of sub structure and super structure with their functions,
Foundations: Types & their suitability, Detailed drawing of Isolated footing and under reamed pile foundation using AutoCAD
Doors and Windows: Technical terms, classification, uses. Detailed drawing of paneled door and windows using AutoCAD

Unit 3: Components of Building (II)   4 hrs

Staircase: Types, materials, design of stair. Ramps, ladders, lifts and escalator. Detailed design and drawing of quarter turn, dog legged and open well staircase using AutoCAD
Masonry: Types of brick and stone masonry, bonds in brickwork and stone masonry.
Roof construction: Roofing materials, types, selection criteria.

Unit 4: Principles of Building Planning and Bye laws   3 hrs

Site Selection criteria, Significance of Sun &Wind Diagram, Types of buildings, Basic requirements of good buildings, Planning, Orientation and criteria under Indian condition, Principles of planning, Ventilation- objectives, types, selection of ventilation system, Concept of green building.
Bye laws: Definition, Necessity and different bye laws as per SP-7, 1983 National Building code.

Unit 5: Planning, Design and Drawing of Residential Buildings   6 hrs

Planning and Design of Residential buildings, Preparation of Submission drawing using AutoCAD - Bungalow, Twin Bungalow, Apartments.

Unit 6: Building Services   3 hrs

Concept of Plumbing & Drainage plan, Plumbing systems, Types of traps, Fittings, Septic Tank, Soak pit, Plumbing layout for residential buildings using AutoCAD.
Furniture for residential buildings, Furniture layout of building.

References:

1. M.G. Shah, C. M. Kale and S.Y. Patki "Building Drawing with an Integrated Approach to Built Environment", 4th Edition, Tata McGraw- Hill publication Ltd., 2002, New Delhi.
2. B.C. Punmia, Ashok kumar Jain and Arun Kumar Jain "Building Construction", Laxmi Publications Pvt. Ltd, 1993, New Delhi.
3. Arora, S.P. and Bindra, S.P. "A Text book of Building construction" (Eleventh Reprint), DhanapatRai Publications, 2012, New Delhi.
4. V.B. Sikka "A Course in Civil Engineering Drawing", S. K. Kataraia & Sons publication, 2010, New Delhi.
5. S.K. Duggal "Building Materials", Third Revised Edition, New Age International Publishers, 2010, New Delhi.
6. S.C. Rangwala, K.S. Rangwala and P.S. Rangwala "Building Construction", 25th Edition, Charotar Publishing House Pvt. Ltd., 2011, New Delhi.
7. IS: 962 – 1989 Code for Practice for Architectural and Building, New Delhi, (June 1993 Reprint)
8. SP–7(I):1983, 'National Building Code of India 1983 (Group I) Part- III Development Control Rules and General Building Requirements. Indian Standard Institution.

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
2	--	--	2	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

The syllabus of Environmental Science provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Their exposure to subjects like understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management and the effects of global climate change, will help the students to bring a systems approach to the analysis of environmental problems.

Course Outcomes:

After successful completion of this course students should be able to :
1. Understand the importance and sensitivity of environment.
2. Avoid over exploitation of natural resources and follow the environmental ethics.
3. Do the sustainable practices for sustainable development.
4. Protect environment and prevent environmental pollution.
5. Apply their knowledge and skills to solve their environment related problems.

Unit Wise Syllabus:

Hrs

1. Natural Resources: 4

Renewable and Non-renewable resources, Forest resources, water resources, Mineral resources, food resources, Energy resources, alternative energy resources, Land resources(Use & overexploitation, Problems), Role of individual in conservation of natural resources, Equitable use of resources for sustainable life styles.

2. Ecology and Environment: 4

Definition, Principles and Scope of ecology, Ecosystem: Structure and Functions, biotic and abiotic components, energy flows, food chains, food web, ecological pyramids, Biodiversity, types of biodiversity, conservation of biodiversity.

3. Environmental Pollution and Control Measures 4

Environmental Pollution, types of pollution, Air pollution, Water Pollution, Noise Pollution, Soil Pollution, Marine Pollution, Radioactive Pollution, Thermal Pollution (Causes, sources and effects, abatement methods), Pollution Case studies-Bhopal Gas Tragedy, Chernobyl Accident: A nuclear Disaster, Ganga Water Pollution.

4. Solid Waste, Hazardous waste and Disaster Management 4

Solid Waste management, Urban & industrial Waste Management,(Causes, sources, effects & control measures), Hazardous waste management, Plastic waste management, E-waste management, Waste minimization technology, Disaster management. Disaster management and risk analysis: Flood, Earthquakes, Cyclones, Landslides, Draught, Tsunami etc.

5. Environmental Management 4

Environmental impact assessment, Impact Assessment Methodologies, Environmental impact statement and environmental management plan, Environmental audit, Cost-benefit analysis, Role of Central Pollution Control Board (CPCB), State Pollution Control Board, Role of NGO's, Role of Information technology in environment & human health, Environmental Ethics: Issues & possible solutions, Awareness of Environmental Legislation.

6. Social Issues and Environment 4

From unsustainable to sustainable development, Urban problems related to energy, Water conservation: Rainwater harvesting, Watershed management, Resettlement & rehabilitation of people: Problems & concerns, Climate change, Global Warming, Ozone layer depletion, Acid Rain, Consumerism & waste Products, Concepts of Eco-labeled products, Eco-mark, Public Environmental education & awareness regarding environmental issues.

Text Books:

1. P. D. Sharma "Ecology and Environment", Rastogi Publications (2011).
2. Dr. J. S. Samant "Environmental Studies", Shivaji University, Kolhapur.
3. Deeksha Dave and S. S. Katewa "Environmental Science & Engineering", Cengage Delmar Learning India Pvt (2012).
4. V. K. Ahluwalia and Sunita Malhotra "Environmental Science", Narosa Publication.
5. P. Anandan & R. Kumaravelan "Environmental Science & Engineering", Scitech Pub., August 2009.

S.Y B. Tech. Civil Engineering – Sem. - III
CE 2071: Strength of Materials Lab

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	100	50

Course Description:

Strength of Material Lab is one of the core practical courses offered at third semester of Civil Engineering undergraduate programme and it comprises of Eight practicals. Structural Engineering is one of the important branches of Civil Engineering. It deals with the various tests to be conducted on construction materials. The design of any structure or structural element is not possible unless the properties of materials are known. The testing of material includes determination of all the forces acting on a material and finding the corresponding stresses induced. Thus for design of any structural element analysis is the first stage. This course, 'Strength of Material Lab' deals with the analysis of various materials such as steel, different metals, bricks and structural element.

Course Outcomes:

After successful completion of this course students should be able to :
1. Demonstrate behavior of material under axial shear and bending forces.
2. Identify various types of stresses in various structural elements.
3. Calculate various types of load.
4. Find strengths of different construction materials.
5. Select a material for a given use based on considerations of cost and performance.
6. Understand the limits of materials and the change of their properties with use.

Lab Work:

i) Experiments (Any six)
1. Tension test on Mild and TOR steel.
2. Shear test on Mild steel.
3. Brinell and Rockwell Hardness test on different metals.
4. Impact test on different metals.
5. Bending test on Mild steel.
6. Flexure test on flooring tiles.
7. Water absorption & compression test on burnt brick.
8. Buckling test on long columns

ii) Assignments : One assignment per unit

Reference Books:

1. Dr.Shah, H. J. and Junnarkar S.B. "Mechanics of Structures", Charotar Publishing House Pvt Limited, New Delhi, 27th Edition (2007).
2. Khurmi, R.S. "Strength of Materials", Chand (S.) & Co Ltd, India, 2015.
3. Ramamrutham, S. "Strength of Materials", Dhanpat Rai Publishing Company (P) Limited, New Delhi, (2012).
4. Vaidyanathan, R., Perumal, P., Lingeswari, S. "Mechanics of Solids and Structures", Scitech Publications Pvt. Ltd., Chennai, Vol. I (2012).

17

S.Y B. Tech. Civil Engineering – Sem. - III
CE 2091: Surveying Lab

Teaching Scheme					Evaluation Scheme				
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
--	--	4	2	ISE	--	--	--	50	50
				ESE	--	--		50	50

Course Description:

Before starting to any civil engineering project, surveying knowledge is very essential for a civil engineer. Surveying is offered as the course in the first semester of second year engineering consists of two modules, the first module focuses on the Temporary and permanent Adjustments in leveling, Reciprocal, Profile Levelling and Cross sectioning, Methods of Plotting Contours, Plane table techniques, Calculation of earthwork in cutting and embankment for civil engineering works. The second module focuses on Theodolite traversing and omitted measurements, Tachometry and Layout surveys, and Curve surveying.

Course Outcomes:

After successful completion of this course students should be able to :
1. Apply the surveying principles for completion various civil engineering projects.
2. Perform precise levelling work for topographic surveying.
3. Calculate reduced levels and Prepare contour maps.
4. Prepare the maps for various surveying areas by using the theodolite traverse concept
5. Use Plane table techniques and its accessories for traversing.
6. Design and Set out the curve on field.

Lab Work:
i) Practicals
1. Illustration of Permanent adjustment of Dumpy Level.
2. Various Methods of Plane Table Survey.
3. Measurement of area by Planimeter.
4. Theodolite and Measurement of horizontal angle by various methods.
5. Measurement of Magnetic bearing and vertical angle by Theodolite
6. Tacheometry: Determination of tachometric constants and grade of line
7. Tacheometry: Determination of area of a polygon.
8. Determination of elevation of inaccessible objects – case I and Case II
9. Setting out of Simple circular curves by minimum three methods
10. Introduction to total station- Working and operating principle.
11. Measurements by using total station- Angle, Distance And Elevation

12. Traversing by total station.

ii)   Mini Projects (All)

    1. Theodolite Traversing Project
    2. Block contouring by Total station
    3. Road Project of 1000m length by Total Station

Text Books:

1. Dr. B.C. Punamia, "Surveying Vol. I, II and III" - Laxmi Publishers. New Delhi, Surveying Vol. I, II and III, New edition, 2014.
2. Prof. T.P Kanetkar and S.V Kulkarni, "Surveying and Levelling Vol. I and II", Pune Vidhyarthi Gruh, New edition, 2010
3. Dr. K.R. Arora, "Surveying Vol. I, II and III" - Standard Book House. New Delhi
4. S. K. Duggal, "Surveying Vol. I and II" -, Tata McGraw Hill, New Delhi
5. N.N. Basak, "Surveying and Levelling" - Tata Mcgraw Hill, New Delhi
6. R. Agor, Khanna Surveying and Levelling - Publishers, New Delhi
7. Dr.A M Chandra, "Plane surveying", New Age Publisher.

References Books:

1. James M. Anderson, Edward M. Mikhail, "Introduction to Surveying" by Published by McGraw-Hill Companies
2. David Clark (Author), "Plane and Geodetic Surveying for Engineers", Vol. 2.

19

CE 2111: Building Construction & Planning Lab

Teaching Scheme				Evaluation Scheme						
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)		
					Max	Min for Passing		Max	Min for Passing	
--	--	4	2	ISE	--	--	--	50	50	
				ESE	--	--		50	50	

Course Description:
This course will integrate your knowledge and understanding of fundamentals of construction technology and processes. Specifically, this course emphasises the role of materials, methods, techniques and sequencing in the construction of buildings. Through your critical engagement in case studies you will consider the environmental impact of construction processes. Your developed knowledge of construction processes will include understanding the role of planning and scheduling in the effective management of construction resources.

Course Outcomes:
After successful completion of this course students should be able to :
1. Prepare drawings of various building components using AutoCAD software.
2. Design the components of the building for the given dimensional requirements.
3. Choose the site for construction of residential buildings by following the selection criteria.
4. Explain the principles of planning of residential buildings.
5. Illustrate the concepts of plumbing and drainage plan.
6. Describe the procedures of applying various building finishes.

Lab Work:
Part A: Free hand sketches of the following in the sketch book:
i. Doors: Flush doors, Revolving door, Collapsible door and rolling shutter.
ii. Windows: Louvered window, Sliding Window, Bay window, Casement
iii. Window, Dormer Window, Corner Window.
iv. Roofs: Line Sketches of steel trusses for different spans.
v. Stairs: Quarter turn, bifurcated, Spiral, Geometrical.
vi. R.C.C. Lintels &Chajja

Part B: Sketches using CAD for the following:
1. Foundations- Details of shallow and deep footing – 1 no. each
2. Doors & windows: 1 no. each.
3. Staircase: Any one Type

Part C: A site visit and technical report based on the visit.

Part D: Residential Building Project

1. Drawing based on actual measurement of existing residential building consisting of plan, elevation, section passing through staircase, site plan, area statement & brief specifications using CAD.
2. Planning & design of a residential building. Individual projects to be planned. Students should prepare all drawings of building project using CAD. Following set of drawings for the building planned using CAD is to be prepared.
   (a) Municipal Submission drawing.
   (b) Working Drawings:
   • Foundation / Centre Line Drawing.
   • Furniture layout plan.
3. Water supply & drainage plan.
4. Project report giving design details of various elements of building such as staircase, drainage system, water supply system, water tank, septic tank etc.

References:

1. Building Drawing with an Integrated Approach to Built, Environment 4th Edition –M.G. Shah, C. M. Kale and S.Y. Patki, Tata McGraw- Hill publication Ltd., New Delhi, 2002.
2. Building Construction – B.C. Punmia, Ashok kumar Jain and Arun Kumar Jain, Laxmi Publications Pvt. Ltd, New Delhi, 1993.
3. A Text book of Building construction (Eleventh Reprint) –Arora, S.P. and Bindra, S.P., DhanapatRai Publications, 2012.
4. A Course in Civil Engineering Drawing- V.B. Sikka, S. K. Kataraia& Sons publication, New Delhi, 2010.
5. Building Materials, Third Revised Edition – S.K. Duggal, New Age International Publishers, 2010.
6. Building Construction, 25th Edition, S.C. Rangwala, K.S. Rangwala and P.S. Rangwala, Charotar Publishing House Pvt. Ltd., 2011.
7. IS: 962 – 1989 Code for Practice for Architectural and Building, New Delhi, (June 1993 Reprint)
8. SP–7(I):1983, 'National Building Code of India 1983 (Group I) Part- III Development Control Rules and General Building Requirements. Indian Standard Institution.

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
1	--	2	2	ISE	--	--	--	100	50

Course Description:

This course introduces basic skills required to develop computer programs using modern computer systems, assuming little or no previous experience. It also introduces fundamental concepts of program construction in a suitable high-level programming language. The course has a significant practical component requiring students to construct small programs.

Course Learning Outcomes:

After successful completion of this course students should be able to :
1. Explain functions & fundamentals of C Language,
2. Apply commands used in C language
3. Discuss concept of C++ language
4. Differentiate between C & C++
5. Apply various commands used in C++,
6. Read codes written in C++

Lab Work:

1   C Language Fundamentals and Functions

Character set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedenceof operators, Input-output Assignments, Control structures, Decision making and Branching, Decision making & looping.
User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Recursion, Storage Classes.

2   Arrays and Pointers

One dimensional Array, Multidimensional Array declaration and their applications, String Manipulation.
Pointer variable and its importance, Pointer Arithmetic, passing parameters by reference, pointer to pointer, linked list, pointers to functions, dynamic memory allocation.

3   Structures, Unions and File Handling

Declaration of structures, declaration of unions, pointer to structure & unions.
Console input output functions, Disk input output functions, Data files.

4   Introduction to C++

Exception Handling, Object Oriented Programming, Standard Template Library

5 Expressions and Statements

A Deck Calculator, Operator Summary, Statement Summary, Comments and Indentation

6 Functions, Exceptions

Function Declarations ,Argument Passing ,Value Return ,Overloaded Function Names, Default Arguments ,Pointer to Function ,Macros ,Namespaces, Exceptions

References:
1. Gottfried B.S. "Programming in C", McGraw Hill Education, 3rd edition, 2010.
2. B.W.Kernighan, D.M.Ritchie "The 'C' programming language", PHI, 2nd edition, 1988.
3. Balaguruswami "Programming in ANSI C", McGraw Hill Education, 6 edition, 2012.
4. H. Sohildt "C The Complete Reference", McGraw-Hill Education, 4th edition, 2000.
5. Y.Kanetkar "Let us C", BPB Publications, 13th Revised and Updated edition 2016.

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
--	--	2	2	ISE	--	--	--	100	50

Course Description:

Mini project has been incorporated to enhance high potential in the student and built research and positive attitude towards environment related issues, which will help them in their social and technical life ahead. The mini project is designed to make them apply practical knowledge with relevant tools and techniques to solve real life problems related to the environment & industry. It will help students in developing eco-friendly approach to achieve sustainable development.

Course Learning Outcomes:

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

1. Develop as an individual and in group leadership quality.

2. Identify and analyse social problems in Civil Engineering.

3. Develop presentation skill through oral and report writing.

4. Acquire theoretical knowledge regarding various problems in Civil Engineering.

Lab Work:

Students should able to do elementary technical work and prepare report along with defining methods and probable suggestions to measures related to various sub-branches of Civil Engineering. The topic for the mini-project may be related to Civil Engineering and interdisciplinary area such as –

1. Structural Engineering
2. Concrete Technology
3. Environmental Engineering
4. Geotechnical Engineering
5. Transportation Engineering
6. Infrastructural Engineering
7. Water Resources Engineering
8. Town & Country Planning
9. Construction Engineering
10. Surveying & Remote Sensing Techniques
11. Project Management
12. Legal Aspects in Civil Engineering
13. Earthquake Engineering
14. Disaster Management

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)
Second Year Engineering UG Programme

Course Code: SH 254   **Course Title: Personal Effectiveness and Body Language Lab**
Teaching Scheme and Credits:

L	T	P	C
0	0	2	1

Evaluation Scheme: ISE- 100% [60% + 40%]   **(Minimum Passing Marks: 50%)**

	Details of the Content	Hrs.
1.	Competency Mapping (Concept, Criteria, Need, Tools)	02
2.	Personality Typing (Extraversion, Introversion, Sensing, Intuition, Thinking, Feeling, Judging Perceiving)	02
3.	Goal Setting	02
4.	SWOT Analysis	02
5.	Effective Personal Time utilization (Benefits and Obstacles)	02
6.	Strategies for effective time management (Principles, Planning, Identify & Control time stealers, Prioritize, Problems and Solutions, Learn to say NO)	02
7.	Stress Management (Meaning, Causes, Types, Remedies)	02
8.	Stress Management Techniques-I: Deep Breathing Exercise, Meditation and Visual Imagery	02
9.	Stress Management Techniques-II: Muscle Relaxation, Peer Sharing	02
10.	Learning Styles – I (visual)	02
11.	Learning Styles – I (auditory, tactile)	02
12.	Body Language – I (Proxemics)	02
13.	Body Language – II (Kinesics: movement, gesture, posture, facial expression and eyes)	02
14.	Body Language – III Paralanguage (vocal cues) and Haptics (touch)	02
15.	Body Language – IV (Appearance)	02
	Total Hrs.	**30**

Reference Books:

1. S. Hariharan, et al; *Soft Skills*, MJP Publishers, Chennai (2010)
2. Gopalaswamy Ramesh et al. *The ACE of Soft Skills: Attitude, Communication and Etiquette for Success*, New Delhi: Pearson Education, 2012. Print.
3. Jeff Butterfield, *Soft Skills for Everyone*, cengage Learning India Private Limited, 2010.
4. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)

5. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning, 2012. Print.

Course Learning Outcomes: After successful completion of the course student will be able to-
1. Develop skills to build self-esteem and positive attitude.
2. Discover ways to overcome procrastination.
3. Demonstrate responsiveness towards stress and health issues.
4. Interpret the non-verbal behaviour of a person.

Evaluation Method: In each session student should be assessed. Each assessment should be of minimum 10 marks. Out of 100 marks of ISE, 60 marks will be for continuous assessment and 40 marks will be for comprehensive assessment at the end of the semester.

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)
Second Year Engineering UG Programme

Course Code: SH 255   **Course Title: Interpersonal Skills Lab**
Teaching Scheme and Credits:

L	T	P	C
0	0	2	1

Evaluation Scheme: ISE- 100% [60% + 40%]   **(Minimum Passing Marks: 50%)**

	Details of the Content	Hrs.
1.	Goal Setting	02
2.	SWOT Analysis	02
3.	Social Networking	02
4.	Interpersonal Relationships – I (in Public Social Settings)	02
5.	Interpersonal Relationships – II (in the Workplace)	02
6.	Dealing with Difficult People – I (Basic Set of Strategies)	02
7.	Dealing with Difficult People – II (Specific Types of Difficult People)	02
8.	Conflict Resolution - I (Constructive Conflict Resolution, Conflict Resolution Strategies)	02
9.	Conflict Resolution – II (Destructive Conflict Resolution, Peer Mediation, Problem Solving and Negotiation)	02
10.	Decision Making – I (Approaches to Decision Making, Make Good Choices, Effect of Choices)	02
11.	Decision Making – II (Individual and Group Decisions)	02
12.	Personal Branding/ Self Presentation	02
13.	Facilitation, Inspiring	02
14.	Persuasion, Collaborating	02
15.	Preparing for and Dealing with Change	02
	Total Hrs.	30

Reference Books:

1. S. Hariharan, et al; *Soft Skills*, MJP Publishers, Chennai (2010)
2. D. Sudha Rani; *Business Communication and Soft Skills Laboratory Manual*, Pearson Education, Mumbai (2012)
3. Krishna Mohan and Meera Banerji; *Developing Communication Skills*, 2nd Edition, Macmillan India Ltd., New Delhi (2012)
4. Gopalaswamy Ramesh et al. *The ACE of Soft Skills: Attitude, Communication and Etiquette for Success*, New Delhi: Pearson Education, 2012. Print.

5. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning, 2012. Print.

6. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)

7. Jeff Butterfield, *Soft Skills for Everyone*, cengage Learning India Private Limited, 2010.

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

1. Exhibit interpersonal communication skills.

2. Demonstrate decision-making skills.

3. Apply conflict resolution styles appropriate in different situations.

4. Demonstrate leadership skills.

Evaluation Method: In each session student should be assessed. Each assessment should be of minimum 10 marks. Out of 100 marks of ISE, 60 marks will be for continuous assessment and 40 marks will be for comprehensive assessment at the end of the semester.

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)
Second Year Engineering UG Programme

Course Code: SH 256   **Course Title: Leadership and Public Speaking Lab**
Teaching Scheme and Credits:

L	T	P	C
0	0	2	1

Evaluation Scheme: ISE- 100% [60% + 40%]   **(Minimum Passing Marks: 50%)**

	Details of the Content	Hrs.
1.	Goal Setting	02
2.	SWOT Analysis	02
3.	What is a team? Personalities and role preferences in teams, Critique a hypothetical team, Everyday teamwork planning tools	02
4.	Leadership, assertiveness, and cooperation	02
5.	Maintaining your team, Addressing team conflict	02
6.	Leadership and Change: Personal leadership and leadership styles, Learning and learning to learn, Leadership of change, Appreciative inquiry and Appreciative leadership, People's reactions to change	02
7.	Leadership Skills: Coaching skills, Leadership in groups: building and leading efficient teams	02
8.	Leadership Skills: Conflict management and handling difficult conversation, Communications skills, especially listening skills	02
9.	Strategic Management: Creating a vision, Analyse the strengths and weaknesses of an organisation	02
10.	Strategic Management: Organisational Design, The basics of a planning process	02
11.	Qualities Of Effective Speakers, Managing Nerves and Building Confidence	02
12.	Doing the initial planning and knowing your audience, Planning the basic structure of your presentation	02
13.	Making your presentation convincing and surprising, PowerPoint Presentation and Audio-Visual Excellence	02
14.	Audience Engagement	02
15.	Handling questions and answers with ease	02
	Total Hrs.	**30**

Reference Books:

1. Krishna Mohan and Meera Banerji; *Developing Communication Skills*, 2nd

Edition, Macmillan India Ltd., New Delhi (2012)

2. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning, 2012. Print.
3. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)
4. Jeff Butterfield, *Soft Skills for Everyone*, cengage Learning India Private Limited, 2010.
5. John Seely, *Oxford Guide to Effective Writing and Speaking*; Oxford University Press, 2009.

Course Learning Outcomes: After successful completion of the course student will be able to
1. Exhibit the ability to work effectively in team.
2. Describe the traits of a leadership through real life examples.
3. Plan the speech as per the audience and context requirements.
4. Analyze public speeches.

Evaluation Method: In each session student should be assessed. Each assessment should be of minimum 10 marks. Out of 100 marks of ISE, 60 marks will be for continuous assessment and 40 marks will be for comprehensive assessment at the end of the semester.

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)
Second Year Engineering UG Programme

Course Code: SH 257 **Course Title: Corporate Competency Lab**
Teaching Scheme and Credits:

L	T	P	C
0	0	2	1

Evaluation Scheme: ISE- 100% [60% + 40%] **(Minimum Passing Marks: 50%)**

	Details of the Content	Hrs.
1.	Goal Setting	02
2.	SWOT Analysis	02
3.	Corporate Etiquettes (Business dress and grooming, Office etiquettes)	02
4.	Professional Ethics and Lifelong learning	02
5.	Presentation Skills (PPT) – I (Content Organization)	02
6.	Presentation Skills (PPT) – II (Preparing Oneself and Delivery)	02
7.	Presentation Skills (PPT) – III (Delivery and Dealing with Feedback)	02
8.	Business Meetings	02
9.	Group Discussion – I (Dos and Don'ts; Structured)	02
10.	Group Discussion – II (Unstructured)	02
11.	Interview Techniques – I (Preparing for Most Common Set of Questions)	02
12.	Interview Techniques – II (Appearance and Body Language)	02
13.	Interview Techniques – III (Mock Interviews)	02
14.	Online Communication – I (Tips, Dos and Don'ts, Exercises of Video Conferencing)	02
15.	Online Communication – II (Tips, Dos and Don'ts, Exercises of Tele Conferencing)	02
	Total Hrs.	**30**

Reference Books:

1. Koneru, *Professional Communication*, Tata McGraw-Hill Education, 2008
2. Masters, L. Ann et al. *Personal Development for Life and Work*, New Delhi: Cengage Learning, 2012. Print.
3. UNLESH the power within... Soft Skills – Infosys Training Manual *Module 1 to 5* (Infosys Campus Connect Programme)
4. John Seely, *Oxford Guide to Effective Writing and Speaking*; Oxford University Press, 2009.

31

5. Thomas N. Huckin and Leslie A. Olsen, *Technical Writing and Professional Communication for Nonnative Speakers of English*; Tata McGraw Hills, International Edition, 1991.

6. Jeff Butterfield, *Soft Skills for Everyone*, cengage Learning India Private Limited, 2010.

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

1. Demonstrate professional etiquette and ethics.
2. Apply various presentation tools.
3. Perform confidently in screenings of campus placement drives.
5. Participate in meetings through video and tele-conferencing.

Evaluation Method: In each session student should be assessed. Each assessment should be of minimum 10 marks. Out of 100 marks of ISE, 60 marks will be for continuous assessment and 40 marks will be for comprehensive assessment at the end of the semester.

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)
Second Year B. Tech. UG Programme

Course Code: SH 258 **Course Title: Introduction to English Literature**
Teaching Scheme and Credits:

L	T	P	C
-	-	2	1

Evaluation Scheme: ISE- 100% [60% + 40%] (Minimum Passing Marks: 50%)

Details of the Content	Hrs.
Prose/Essay:	
1. Knowledge and Wisdom – by Bertrand Russell	3
2. The Samphire Gatherer – by W. H. Hudson	3
Poem:	
3. The Rime of the Ancient Mariner – by S. T. Coleridge	5
4. Mending Wall – by Robert Frost	1
5. The Tyger – by William Blake	2
Short Story:	
6. The Rocking-Horse Winner – by D. H. Lawrence	3
7. Jimmy Valentine – by O. Henry	3
One-Act Play:	
8. The Boor – by Anton Chekhov	5
9. Lithuanian – by Rupert Brooke	5
Total Hrs.	**30**

Reference Books:

1. Satyanarain Singh (Ed.). *Six Famous Plays*, Macmillan Indian Limited, Delhi, 1994.

2. S. Jagadisan (Ed.). *Avenues to English Prose*, Oxford University Press, Delhi, 1987

3. C. N. Ramachandran, et al. *Five Centuries of Poetry*, Macmillan Indian Limited, Delhi, 1994.

4. A. S. Balakrishnan. *The Refugee and Other Stories*, Orient Longman, Hyderabad, 1997.

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

1. Explain literary concepts and the underlying aesthetics of English literature.
2. Demonstrate reading skills.
3. Interpret different types of text.
4. Make use of newly learnt words in various contexts.

Evaluation Method: In each session student should be assessed. Each assessment should be of minimum 10 marks. Out of 100 marks of ISE, 60 marks will be for continuous assessment and 40 marks will be for comprehensive assessment at the end of the semester.

*Important Note: The course will be taught by RIT in-house faculty.

S. Y. B.Tech – Sem. IV

Course Code	Course	Teaching Scheme				Evaluation Scheme					
								Theory (Marks %)		Practical (Marks %)	
		L	T	P	Cr	Scheme	Max	Min. for passing	Max	Min. for passing	
CE2021	Structural Analysis	3	1	--	4	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2042	Fluid Mechanics	4	--	--	4	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2061	Water Resources Engineering	3	-	--	3	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2081	Engineering Geology and GIS application	4	-	--	4	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2101	Building Planning and Design	3	-	--	3	ISE	20		40	-	-
						UT 1	15				
						UT 2	15				
						ESE	50	40			
CE2121	Fluid Mechanics Lab	--	--	2	1	ISE	-	-	-	100	50
CE2141	Building Planning and Design Lab	--	--	4	2	ISE	-	-	-	50	50
						ESE	-	-	-	50	50
CE 2161	Engineering Geology and GIS application Lab	--	--	4	2	ISE	-	--	-	50	50
						ESE	-	-	-	50	50
SH254/ 255/256/ 257/258	Professional Skill Development- II	--	--	2	1	ISE	-	-	-	50	50
						ESE	-	-	-	50	50
	TOTAL	17	1	12	24						

Total Contact Hours/week : 30
Total Credits : 24

S.Y B. Tech. Civil Engineering – Sem. - IV
CE2021: Structural Analysis

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	1	--	4	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

Structural Analysis is one of the core courses offered at fourth semester of Civil Engineering undergraduate program and it comprises of six units. Structural Engineering is one of the important branches of Civil Engineering. It deals with the design of various structures. The design of any structure or structural element is not possible unless all the forces and corresponding stresses induced in the structure are known. The analysis of structure includes determination of all the forces acting on a structural element and finding the corresponding stresses induced. Thus for design of any structural element analysis is the first stage. This course, 'Structural Analysis' deals with the analysis of various determinate structures, such as beams, columns and trusses. This will help the students to analyze and design different structural elements.

Course Outcomes:

After completing the course, the student should be able to: -
1. Calculate slopes and deflections at various locations for different types of beams.
2. Calculate forces in the members of determinate trusses and deflection of determinate trusses.
3. Calculate hinge reactions at the end hinges of three hinged arches.
4. Calculate shear force and bending moments at the various sections of three hinged arches.
5. Construct ILD for determinate beams and 2D trusses.
6. Analyze and design circular shafts subjected to torsion.
7. Calculate strain energy stored in the material due to gradual, sudden and impact loads.
8. Analyze and design columns using Euler's and Rankine's formulae.

Pre-requisites:

For studying this course the student should have studied the courses Engineering Mechanics and Strength of Materials. The knowledge of Engineering Mechanics will help to identify different types of loads, preparing free body diagrams and finding support reactions. The knowledge of Strength of Materials will help them to determine, stresses and strains due to axial loadings,

shear force and bending moment at various sections of beams, shear and bending stresses in the various beam sections. The knowledge of basic mathematics and trigonometry is also required.

Unit Wise Syllabus:

Unit: 1 Basic concepts of structural analysis   06

Basic concepts of structural analysis, Betti-Maxwell reciprocal theorem. Slope and deflection of determinate beams – Double Integration method and Macaulay's method.

Unit: 2 Slope and deflection of beams   06

Slope and deflection of determinate beams -Moment area method, Conjugate beam method

Unit: 3 Analysis of trusses   06

a) Analysis of pin jointed trusses, Method of joints, Method of sections.

b)Deflection of determinate 2D trusses - Castigliano's first theorem.

c) Three hinged arches.

Unit: 4 Influence line diagrams   06

Muller-Breslau's Principle, Influence Line Diagrams for Simple and compound beams. Application of influence line diagram to determinate 2D trusses under dead load and live load.

Unit: 5 Torsion and strain energy   06

a) Torsion of circular shafts: Theory of Torsion, assumptions, derivation of torsion formula. Stresses, strains and deformations in determinate shafts of hollow, solid subjected to twisting moments. Power transmitted - shafts.

b) Strain energy: Concept, expression of strain energy for axially loaded member under gradual, sudden and impact loads. Strain energy due to self weight, bending and torsion.

Unit: 6 Axially loaded columns   06

Axially loaded columns: Critical load and buckling, derivation of Euler's formula for buckling load with hinged ends. Concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula.

Resources:

1. Dr.Shah, H. J. and Junnarkar, S.B. (2007) 27th Edition, 'Mechanics of Structures'. Vol. I Charotar Publishing House Pvt Limited, New Delhi Page Nos. 494 to 537.
2. Khurmi, R.S. (2012) 23rd Edition, 'Strength of Materials'Page Nos. 463 to 508.
3. Ramamrutham, S. (2012), 'Strength of Materials', Dhanpat Rai Publishing Company (P) Limited, New Delhi. Page Nos. 452 to 494.
4. Vaidyanathan, R., Perumal, P., Lingeswari, S., (2012), 'Mechanics of Solids and Structures' Vol. I, Scitech Publications Pvt. Ltd., Chennai, Page Nos. 7.1 to 7.79

S.Y B. Tech. Civil Engineering – Sem. - IV
CE 2141: Fluid Mechanics

Teaching Scheme					Evaluation Scheme				
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
4	--	--	4	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

Fluid mechanics is the branch of physics that studies the mechanics of fluids (liquids and gases) and the forces on them. Fluid mechanics has a wide range of applications, including for mechanical engineering, chemical engineering, geophysics, astrophysics, and biology. Fluid mechanics can be divided in fluid statics, the study of fluids at rest and fluid dynamics, the study of the effect of forces on fluid motion. It is a branch of continuum mechanics, a subject which models matter without using the information that it is made out of atoms; that is, it models matter from a macroscopic viewpoint rather than from microscopic. Fluid mechanics, especially fluid dynamics, is an active field of research with many problems that are partly or wholly unsolved. Fluid mechanics can be mathematically complex, and can best be solved by numerical methods, typically using computers. A modern discipline, called computational fluid dynamics (CFD), is devoted to this approach to solving fluid mechanics problems. Particle image velocimetry, an experimental method for visualizing and analyzing fluid flow, also takes advantage of the highly visual nature of fluid flow. Fluid statics or hydrostatics is the branch of fluid mechanics that studies fluids at rest. It embraces the study of the conditions under which fluids are at rest in stable equilibrium and is contrasted with fluid dynamics, the study of fluids in motion. Fluid dynamics is a sub discipline of fluid mechanics that deals with fluid flow the natural science of fluids (liquids and gases) in motion.

Course Outcomes:

After completing the course, the student should be able to: -
1. Analyze different physical properties of fluid.
2. Compute dimensional analysis and model studies.
3. Compute the velocity and acceleration of fluid particle.
4. Know velocity distribution and shear stresses in turbulent flow.
5. Evaluate major and minor losses in pipes.
6. Conversant with dimensional analysis

Prerequisites

Engineering Mechanics

Unit Wise Syllabus:

Unit 1:Fundamental concepts of fluid flow: (04)

Introduction to Fluid mechanics, Properties of fluid (density, unit weight, specific surface, viscosity, surface tension, capillarity, compressibility), Vapour pressure and cavitation. Pascal's law and its applications, Classification of fluids.

Unit 2: Fluid statics (6)

Fluid pressure: Absolute, atmospheric, gauge and vacuum pressures, Pressure head, Pressure measuring devices, hydrostatic forces on submerged surfaces (horizontal, vertical and inclined, Buoyancy and floatation: Buoyancy, buoyant force, centre of buoyancy, metacentre, metacentric height, theoretical background of stability of submerged and floating bodies.

Unit 3: Fluid kinematics & fluid dynamics: (06)

Displacement, velocity and acceleration of fluid particle, Continuity equation, Introduction to: rotational and irrotational flow, velocity potential and stream function, flow net. Euler's equation, Bernoulli's equation and its applications for measurement of flow , impulse momentum theory and its application, siphon, water hammer in pipes.

Unit 4: Flow through pipes (07)

Introduction, Reynolds experiment, Laws of fluid friction for laminar and turbulent flow, Introduction to Laminar and turbulent flow in pipes. Head loss: Concept of major and minor head loss, Darcy-Weisbach equation for determination of major loss, determination of minor losses, pipes connected in series and parallel, concept of equivalent pipe, Turbulent flow in smooth and rough pipes.

Unit 5: Flow through open channels (07)

Classification of flow, Uniform flow, Prismatic and non prismatic channel, hydraulically efficient channel cross sections (rectangular, trapezoidal, circular) concept of specific energy, subsequent depths, subcritical and supercritical flow in rectangular channels, hydraulic jump, practical section for open channel flow. Introduction, theoretical background of Notches and weir for measurement of flow, types.

Unit 6: Dimensional analysis and similitude (05)

Dimensional homogeneity, Buckingham's π theorem, important dimensional numbers and their significance, geometric, Kinematic and dynamic similarity, Model studies: distorted and undistorted models, scale effect in models.

Reference Books

1. R. S. Khurmi "Fluid Mechanics" S. Chand & Company Ltd. New Delhi, 12th Edition 1983.
2. Er. R. K. Rajput "Fluid Mechanics" Hydraulic & Hydraulic Mechanics, S. Chand & Company Ltd. New Delhi, 15th Edition 2013.
3. S. Nagrathanam "Fluid Mechanics" Khanna Pub, Delhi, 6th Edition 2011.
4. Modi and Seth "Hydraulics and Fluid mechanics including Hydraulic Machines" –A. D. Computers, New Delhi. 8th Edition 2012

S.Y B. Tech. Civil Engineering – Sem. - IV
CE 2061: Water Resources Engineering

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

Water Resource Engineering is offered as the course in the fourth semester of civil engineering; focuses on the water supplies, irrigation and water disposal. It also addresses methods for controlling water to avoid water-related damage and catastrophe, which helps the students to understand facts, concepts, principles and techniques of scientific investigation in the field of Water Resource engineering. Water Resource Engineering is a course which supports a study of many other advanced courses like Irrigation and hydraulic structures, Water Power Engineering, Fluid Mechanics, Design of hydraulic structures etc., which apply concepts in watershed management, rainwater harvesting, water logging and drainage, stream flow and measurement etc.

Course Outcome:

After completion of this course student should be able to ,
1) Define hydrology and hydrological cycle.
2) Compute average precipitation by Arithmatic, Thiessen polygon and Isohyetel method.
3) Discuss the factors affecting on stream flow site selection.
4) Explain factors affecting on runoff.
5) Identify factors governing consumptive use of water.
6) Categorize various factors affecting on groundwater hydrology.

Unit Wise Syllabus:

Unit: 1 Precipitation   (6)
Introduction to Hydrology, Hydrological cycle and application of hydrology. Precipitation, Types of Precipitation, measurement, analysis of Precipitation data, mass rainfall curves, intensity-duration curves, and concept of depth area duration analysis, frequency analysis. Elementary concepts of evaporation, transpiration, evapo transpiration and infiltration.

Unit: 2 Stream flow and runoff (6)

Selection of site, various methods and instruments of discharge measurements Area velocity method, Area slope method, S. W. F., other modern methods. Factors affecting runoff, rainfall-runoff relationships, runoff hydrograph, unit hydrograph, theory, S-curve hydrograph, synthetic unit hydrograph, use of unit hydrograph. Estimation of peak flow, rational formulae and other methods, flood frequency analysis Gumballs method, Design floods

Unit: 3 Ground water hydrology (6)

Occurrence and distribution of ground water, Specific yield of aquifer, Movement of ground water, Darcy's law, Permeability, Safe yield of basin. Hydraulics of well under steady flow conditions in confined and unconfined aquifers, Specific capacity of well, Well irrigation – Tube wells, Open wells-design and construction

Unit: 4 Irrigation (6)

Water requirement of crops, Soil classification, soil moisture and crop water relationship, factors governing consumptive use of water, principal Indian crops, their season and water requirement, agriculture practices. Cropping pattern, calculations of canal capacities. Soil-water relationship: Classes and availability of soil water, depth and frequency of irrigation.

Unit: 5 Water Logging and Drainage (6)

Water logging and drainage Causes of water logging, preventive and curative measures, drainage of irrigation of lands, reclamation of water logged, alkaline and saline lands. Lift irrigation schemes - Various components and their design principles

Unit: 6 Water and Watershed Management (6)

Need of watershed management, Importance of soil conservation measures, Rainwater management, methods and techniques of Rainwater harvesting and groundwater harvesting, Water management and distribution. Various Methods of Assessment of canal Revenue

Text Books

1. Jay ram reddy, Hydrology, Dhanpat Rai Publishing Company (P) Ltd.
2. S.K. Garg, Water Resources Engineering, Khanna Publishers

Reference Books

1. Dr. P. N. Modi, Irrigation, Water Resources and water power engineering, Standard Publishers,
2. Santosh Kumar Garg, Irrigation and Hydraulic structures, Khanna publishers, Vol.II 24th edition , 2011
3. Dr. Punmia and Dr. Pande, Irrigation and water power Engineering -; Standard Publishers
4. R.K. Sharma, Hydrology & Water resources – Dhanpat Rai Publishing Company (P) Ltd.
5. G.S. Birdie & Das, Irrigation Engineering – Dhanpat Rai Publishing Company (P) Ltd.
6. Varshney, Gupta and Gupta,Theory and design of irrigation structures vol. I, New Chand and Brothers

S.Y B. Tech. Civil Engineering – Sem. - IV
CE2081: Engineering Geology and GIS Applications

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
4	--	--	4	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

This course explores the fundamentals of geology applied to civil engineering problems. Topics include rock and mineral types, soil properties, geological structures, active tectonics and earthquake hazards, slope stability and landslides, groundwater, rivers and flood hazards. The goal of the course is to increase the student's knowledge and understanding of geology, and apply this knowledge to engineering projects such as dams, landfills, rock quarries, roads and tunnels. GIS is an effective tool to analyze spatial, non-spatial data on drainage, geology, land form parameters to understand their interrelation ship.

Course Outcomes:
After completing the course, the student should be able to: -
1) Identify common Earth materials and interpret their composition, origin, and uses.
2) Recognize and interpret geological structures, and be able to apply their knowledge and skills to interpret earth processes.
3) Classify hydro geological properties of various rocks.
4) Describe the processes operating at and beneath the Earth's surface, how those processes create the Earth's landscape and how humans affect and are affected by the processes.
5) Compare the suitable site s for construction of dam, tunnel in different geological formation and geological structures.
6) Effectively understand and interpret spatial relationships of geological and geographical features.

Prerequisites
Earth Science, Geo-informatics and Civil Engineering

Unit Wise Syllabus:

Unit: 1 Physical Geology and Mineralogy   08

Definition, Scope and subdivisions, Application of Geology in civil engineering.
About the Earth. Interior of the Earth, Basic Seismology, Volcano's. Weathering,
Types of weathering, mountains and mountain building. Geological work of River
and Wind in the process of erosion, deposition and transportation, Definition of
mineralogy, some rock forming mineral groups.

Unit: 2 Petrology and Structural Geology   10

Definition of petrology, Rock cycle. Rock types- Igneous, Metamorphic, And
Sedimentary. Engineering properties of Rocks, characteristics of good building
stone, and building stones in India. Outcrop, strike and dip, folds, faults, joints,
unconformities, overlap, outliers and inliers, Civil Engineering considerations of
Geological structures Sources of ground water, water table, zones, porosity and
permeability, Types of aquifers. Importance of groundwater investigation in civil
engineering projects.

Unit:3 Geology of Dams and Tunnel.   08

Preliminary geological investigations, Core drilling, core logging. Influence of
Geological conditions on location, alignment and type of dam, site improvement
techniques, dams on various types of rocks and structures. Geology of Tunnel:
Influence of geological conditions on tunneling, difficulties during tunneling,
Tunneling in Deccan traps. Geological Considerations for Roads and bridges

Unit: 4 Aerial and digital photogrammetry   08

Objectives, Applications in engineering, Aerial camera, comparison of map and
aerial photograph, Vertical, Tilted and Oblique photographs, Scale of vertical
photograph, Relief displacement in vertical photograph, Flight planning-Ground
control Mapping, Mosaics
B) Introduction to digital photogrammetry, different stereo viewing techniques in
digital photogrammetry, Method of creation of elevation data, Different products of
digital photogrammetry.

Unit: 5 Geographical Information System -GIS   08

Introduction, Definition, Objectives, Components, Astronomical Co-ordinate
systems and projections, Geo referencing, Input data, GIS data Types (Raster,
vector, attribute data), introduction to data analysis, vector and raster analysis
methods - query analysis and network analysis for vector, DEM and its application,
Applications of GIS, limitations of GIS, GIS manipulation, analysis and Modeling
with GIS software's.

Unit: 6 GPS   06

 Introduction to GPS, GPS systems (viz. Glonoss, Galileo etc...) and their features,
Segments of GPS (Space, Control and User), their importance and role in GPS,
Advantages and Limitations, Receivers, Absolute Position and Differential Position
GPS(DGPS) Role of Differential Position GPS in establishing controls, Factors
governing accuracy, Different types of errors in GPS, Satellite images.

References:

1. Prabin Singh, Engineering and General Geology, S. K. Katariya and Sons Delhi, 1st Edition, 1984.

2. Dr. D. V. Reddy, Engineering Geology for Civil Engineering, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1st Edition, 1995.
3. N Chenna Kesavulu, Textbook of Engineering Geology, Macmillan Publishers India limited Delhi, 2nd Edition, 2009.
4. B. S. Sathya Narayanswami, Engineering Geology, Dhanpat Rai and Co. (P). Ltd.Delhi.2nd Edition, 2014.
5. K. M. Bangar, Principles of Engineering Geology - Standard Publishers Distributors 1705-B NaiSarak, Delhi.1st Edition, 2015.
6. J. B. Cambell, Introduction to Remote Sensing, Taylor and Francis, UK, 1st Edition, 2002.
7. G. W. Tyrrell Principles of Petrology, B. I. Publication Pvt. Ltd., New Delhi, 1st Edition, 1978.
8. A. Holmes, Principles of Physical Geology, ELBS Chapman and Hall, London.4th Edition,1993.
9. M. P. Billings, Structural Geology, Prentice Hall of India Private Ltd., New Delhi. 1st Edition, 1962.
10. P. K. Mukerjee, A Text Book of Geology, The World Press Pvt. Ltd., Calcutta. 1st Edition, 2005.
11. R. B. Gupte, A Text Book of Engineering Geology, Pune Vidyarthi Griha Prakashan, Pune, 1st Edition, 1962.
12. Todd D. K., Groundwater Hydrology, John Wiley and Son, New York. 3rd Edition, 2004.
13. H. H. Read, Rutley's Elements of Mineralogy, CBS Publishers and Distributors, Delhi, 27th Edition, 1988.
14. T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation -, John Wiley & Sons, Singapore, 5th Edition, 2004.
15. Satheesh Gopi, R. Sathishkumar, Advanced Surveying-Total Station, GIS and Remote sensing-, Pearson publication, 2nd Edition, 2008.
16. Kang Tsung Chan, Geographic Information System, Tata McGraw Hill, 4th Edition, 2007.

S.Y B. Tech. Civil Engineering – Sem. - IV
CE 2101: Building Planning and Design

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

This course will integrate your knowledge and understanding of fundamentals of construction technology and processes. Specifically, this course emphasises the role of materials, methods, techniques and sequencing in the construction of buildings. Through your critical engagement in case studies you will consider the environmental impact of construction processes. Your developed knowledge of construction processes will include understanding the role of planning and scheduling in the effective management of construction resources.

Pre-requisites
Basic Civil Engineering
Building Construction and Planning

Course Outcomes:
On successful completion of this course the students will be able to:
1. Prepare perspective drawings of simple objects and building components using the step wise procedure.
2. Apply the principles of architectural composition in planning and designing of public buildings.
3. Plan and Design a given public buildings based on its functional requirements and site considerations.
4. Describe methods of controlling the noise in the building.
5. Use Sabine's formula for finding reverberation time required for acoustic design of building.
6. Demonstrate the fire extinguishing equipments for preventing the fire in buildings.

Unit Wise Syllabus:
Unit: 1 Elements of Perspective Drawings: 06
Various terms involved, Types of perspectives - one point (parallel) and two point perspective (angular or oblique), perspective drawing of simple objects, perspective drawing of a small building.

Unit: 2 Principles of Architectural Planning 06

The nature of architecture – definition and scope of study, The aesthetic component of building, terms such as mass, space, proportion, Symmetry, balance, contrast, pattern, Integration of aesthetics and function, introduction to concept of interior designing. Dimensions & space requirement in relation to body measurements, Dimensions & space requirement in relation to body measurements.

Unit: 3 Planning of Public Buildings (Part I) 06

Planning and Design, site selection, site layout for various types of building such as:

1. Educational buildings- Younger age range, middle age range, older age range, School for mentally retarded
2. Building for health- Sanatoriums, Hospitals
3. Assembly buildings- Recreational Halls, Community halls, Cinema theatres,
4. Gymnasiums, Restaurant, Temples, Dance halls, Clubs.

Unit: 4 Planning of Public Buildings (Part II) 06

Planning and Design, site selection, site layout for various types of building such as:

1. Business and Mercantile buildings- Shops, Banks, Markets and Departmental stores
2. Industrial buildings- Factories, Warehouse
3. Office and other buildings- Post offices, Administrative buildings etc.
4. Buildings for transportation- Bus stations, Truck terminal

Unit: 5 Acoustics 06

Noise and acoustics: Effect of noise, comfort standards, noise control, sound insulation. Acoustics – reverberation, Sabine's formula, acoustical defects, conditions of good acoustics, sound absorbents, and acoustics for various types of buildings.

Unit: 6 Fire protection 06

Fire safety – fire load, Grading of occupancies - fire load, considerations in fire, protection, properties of fire resistant construction, wall and columns, roofs and floors, wall openings, fire escape elements.

References:

1. M.G. Shah, C. M. Kale and S.Y. Patki Building Drawing with an Integrated Approach to Built Environment 4th Edition –, Tata McGraw- Hill pub. Ltd., New Delhi, 2002.
2. Donald Watson Time-saver standards for urban design -, Tata McGraw Hill Pub., New Delhi, 2011.
3. S.C Agarwal Architecture and Town Planning -, DhanpatRai& Sons, 2007.
4. BeriPramod Form Follows Feelings-, Anjali Prakashan, 2009.
5. IS: 962 – 1989 Code for Practice for Architectural and Building, New Delhi, (June 1993 Reprint)
6. SP–7(I):1983, 'National Building Code of India 1983 (Group I) Part- III Development Control Rules and General Building Requirements. Indian Standard Institution.
7. AutoCAD 2011: A Problem-Solving Approach- A Manual - Bentley Publication, 2011.

S.Y B. Tech. Civil Engineering – Sem. - IV
CE 2121: Fluid Mechanics Lab

Teaching Scheme					Evaluation Scheme				
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	100	50

Course Description:

Fluid mechanics can be mathematically complex, and can best be solved by numerical methods, typically using computers. A modern discipline, called computational fluid dynamics (CFD), is devoted to this approach to solving fluid mechanics problems. Particle image velocimetry, an experimental method for visualizing and analyzing fluid flow, also takes advantage of the highly visual nature of fluid flow. Fluid statics or hydrostatics is the branch of fluid mechanics that studies fluids at rest. It embraces the study of the conditions under which fluids are at rest in stable equilibrium and is contrasted with fluid dynamics, the study of fluids in motion. Fluid dynamics is a sub discipline of fluid mechanics that deals with fluid flow the natural science of fluids (liquids and gases) in motion.

Course Outcomes:

After successful completion of this course, should be able to Select pressure measuring devices
1. Verify of Bernoulli's theorem
2. Determine of metacentric height
3. Use an orifice for discharge measurement
4. Use a venturimeter for discharge measurement in a pipe flow
5. Compute loss of head due to i) Sudden expansion, ii) contraction iii) elbow iv) bend v) globe Valve etc.
6. Construct flow net for given flow conditions

Prerequisites

Engineering Mechanics

Laboratory Work:

1) Experiments:

1. Use of pressure measuring devices.
2. Verification of Bernoulli's Theorem
3. Determination of metacentric height (Stability of submerged and floating body)
4. Calibration of venturimeter
5. Study of factors affecting coefficient of friction for pipe flow (at least for two different materials and two different diameters (Major head loss)
6. Determination of loss of head due to Sudden expansion, contraction, elbow, bend, globe valve etc. (any 2) (Minor head loss)

2) Assignments
   1. Study of streamlines, flow nets
   2. Study of Moody's charts,nomograms for pipe design.

References:

1. R. S. Khurmi "Fluid Mechanics" S. Chand & Company Ltd. New Delhi, 12th Edition 1983.
2. Er. R. K. Rajput "Fluid Mechanics" Hydraulic & Hydraulic Mechanics, S. Chand & Company Ltd. New Delhi, 15th Edition 2013.
3. S. Nagrathanam "Fluid Mechanics" Khanna Pub, Delhi, 6th Edition 2011.
4. Modi and Seth "Hydraulics and Fluid mechanics including Hydraulic Machines" –A. D. Computers, New Delhi. 8th Edition 2012

S.Y B. Tech. Civil Engineering – Sem. - IV
CE 2141: Building Planning and Design Lab

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	4	2	ISE	--	--	--	50	50
				ESE	--	--	--	50	50

Course Description
This course will integrate your knowledge and understanding of fundamentals of construction technology and processes. Specifically, this course emphasises the role of materials, methods, techniques and sequencing in the construction of buildings. Through your critical engagement in case studies you will consider the environmental impact of construction processes. Your developed knowledge of construction processes will include understanding the role of planning and scheduling in the effective management of construction resources.

Pre-requisites
Basic Civil Engineering
Building Construction and Planning

Course Outcomes:
After successful completion of the laboratory course the students will be able to;
1. Explain the terms used in perspective drawing
2. Specify the distances between picture plane and station point; and ground level and eye level
3. Prepare one point perspective drawing and two point perspective drawings of given building/ components using AutoCAD
4. Plan and design a given public building based on the requirements
5. Apply the principles of planning and also, the principles of architecture for planning of public buildings
6. Prepare the building plan, elevation, sectional elevation of given public building using AutoCAD software by adopting appropriate scale.

Laboratory Work :
A) Study of software – 3 turns
B) Drawing of any one public building using Software.
C) Students should prepare detailed drawings of any one type of public building using CAD. Individual project is to be planned.
   1. Layout Plan
   2. Typical floor plan
   3. Elevation
   4. Foundation Plan
   5. Sectional Elevations
   6. Water Supply and Drainage layout

50

D) Preparation of perspective drawing of simple single storey building

References:

1. M.G. Shah, C. M. Kale and S.Y. Patki Building Drawing with an Integrated Approach to Built Environment 4th Edition –, Tata McGraw- Hill pub. Ltd., New Delhi, 2002.
2. Donald Watson Time-saver standards for urban design -, Tata McGraw Hill Pub., New Delhi, 2011.
3. S.C Agarwal Architecture and Town Planning -, DhanpatRai& Sons, 2007.
4. BeriPramod Form Follows Feelings-, Anjali Prakashan, 2009.
5. IS: 962 – 1989 Code for Practice for Architectural and Building, New Delhi, (June 1993 Reprint)
6. SP–7(I):1983, 'National Building Code of India 1983 (Group I) Part- III Development Control Rules and General Building Requirements. Indian Standard Institution.
7. AutoCAD 2011: A Problem-Solving Approach- A Manual - Bentley Publication, 2011.

S.Y B. Tech. Civil Engineering – Sem. - IV
CE 2161: Engineering Geology and GIS Applications Lab

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	4	2	ISE	--	--	--	50	50
				ESE	--	--	--	50	50

Description:

This course explores the fundamentals of geology applied to civil engineering problems. Topics include rock and mineral types, soil properties, geological structures, active tectonics and earthquake hazards, slope stability and landslides, groundwater, rivers and flood hazards. The goal of the course is to increase the student's knowledge and understanding of geology, and apply this knowledge to engineering projects such as dams, landfills, rock quarries, roads and tunnels. GIS is an effective tool to analyze spatial, non-spatial data on drainage, geology, land form parameters to understand their interrelation ship.

Course Learning Outcomes
After completing the course, the student should be able to: -
1. Recognize and describe common geological formations of relevance to civil engineering.
2. Identify the different Rock types.
3. Implement various methods for water conservation techniques.
4. Use of electrical resistivity method for determining depth of bedrock or groundwater.
5. Prepare map using any post processing software for data collected by TS and GPS Receiver.
6. Prepare DEM by using GIS software.

Prerequisites
Earth Science, Geo-informatics and Civil Engineering

Laboratory Work
A. Engineering Geology
1. Study of common rock forming minerals.
2. Study of Igneous rocks.
3. Study of Sedimentary rocks.
4. Study of Metamorphic rocks.
5. Geological Maps.
6. Strike and dip problems.
B. GIS
1. GIS and RS Image reading.
2. Geo-referencing for given data (topo-sheet) by GIS software.
3. Satellite image processing by using GIS software.

4. Slope and water shade analysis by using GIS software
5. Preparation of DEM by using GIS software

C. GPS
1. Study of GPS hand Receiver
2. Measurements by using GPS(Area, Distance)
3. Collection of X, Y, Z, Cordinares of a point.
4. Preparation of maps by using post procedure software's.

D. Mini Project:
1. Detailed Total station Survey of a small property.
2. Preparation of map using any post processing software for data collected by TS and GPS Receiver.

References:

1. Prabin Singh, Engineering and General Geology, S. K. Katariya and Sons Delhi, 1st Edition, 1984.
2. Dr. D. V. Reddy, Engineering Geology for Civil Engineering, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1st Edition, 1995.
3. N Chenna Kesavulu, Textbook of Engineering Geology, Macmillan Publishers India limited Delhi, 2nd Edition, 2009.
4. B. S. Sathya Narayanswami, Engineering Geology, Dhanpat Rai and Co. (P). Ltd.Delhi.2nd Edition, 2014.
5. K. M. Bangar, Principles of Engineering Geology - Standard Publishers Distributors 1705-B NaiSarak, Delhi.1st Edition, 2015.
6. J. B. Cambell, Introduction to Remote Sensing, Taylor and Francis, UK, 1st Edition, 2002.
7. G. W. Tyrrell Principles of Petrology, B. I. Publication Pvt. Ltd., New Delhi, 1st Edition, 1978.
8. Holmes, Principles of Physical Geology, ELBS Chapman and Hall, London.4th Edition,1993.
9. M. P. Billings, Structural Geology, Prentice Hall of India Private Ltd., New Delhi. 1st Edition, 1962.
10. P. K. Mukerjee, A Text Book of Geology, The World Press Pvt. Ltd., Calcutta. 1st Edition, 2005.
11. R. B. Gupte, A Text Book of Engineering Geology, Pune Vidyarthi Griha Prakashan, Pune, 1st Edition, 1962.
12. Todd D. K., Groundwater Hydrology, John Wiley and Son, New York. 3rd Edition, 2004.
13. H. H. Read, Rutley's Elements of Mineralogy, CBS Publishers and Distributors, Delhi, 27th Edition, 1988.
14. T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation -, John Wiley & Sons, Singapore, 5th Edition, 2004.
15. Satheesh Gopi, R. Sathishkumar, Advanced Surveying-Total Station, GIS and Remote sensing-, Pearson publication, 2nd Edition, 2008.
16. Kang Tsung Chan, Geographic Information System, Tata McGraw Hill, 4th Edition, 2007.

(Revised)

Third Year B. Tech. – Sem. V

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Cr	Scheme	Theory (Marks %)		Practical (Marks %)		
							Max	Min. for passing		Max	Min. for passing
CE3011	Design of Steel Structures	3	1	--	4	ISE	20		40		
						UT 1	15			--	-
						UT 2	15				
						ESE	50	40			
CE3031	Soil Mechanics	3	-	--	3	ISE	20		40	--	
						UT 1	15				-
						UT 2	15				
						ESE	50	40			
CE3051	Infrastructure Engineering -I	4	-	--	4	ISE	20			-	-
						UT 1	15		40		
						UT 2	15				
						ESE	50	40			
CE3071	Water Supply Engineering	3	-	--	3	ISE	20			-	-
						UT 1	15		40		
						UT 2	15				
						ESE	50	40			
CE3091	Engineering Management	3	-	-	3	ISE	20			-	-
						UT 1	15		40		
						UT 2	15				
						ESE	50	40			
CE3111	Soil Mechanics Lab	-	--	2	1	ISE	-	-		50	50
						ESE	-	-		50	50
CE3131	Transportation Engineering Lab	-	-	2	1	ISE	-	-		50	50
						ESE	-	-		50	50
CE3151	Engineering Management Lab	--	--	2	1	ISE	-	-		100	50
CE3171	Water Supply Engineering Lab	--	--	2	1	ISE	-	-		100	50
SH3191	Scholastic Aptitude I	1	-	2	2	ISE	-	-		40	40
						ESE	-	-		40	40
CE3201	Industry internship*	-	-	-	-	-	-	-		--	--
	TOTAL	17	1	10	23						

Total Contact Hours/week : 28

Total Credits : 23

* Industry internship work of six week shall start at the end of the semester V and will be assessed at the end of semester VI of Third Year B. Tech.

Third Year B. Tech. Civil Engineering – Sem. V
CE 3011: Design of Steel Structures

Teaching Scheme					Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)		
					Max	Min for Passing		Max	Min for Passing	
3	1	--	4	ISE	20	40	40	--	--	
				UT 1	15					
				UT 2	15			--	--	
				ESE	50	40		--	--	

Course Description:

This is a course in design of steel structures intended to develop a fundamental ability to evaluate and design steel tension members, beams, columns, beam-columns, composite beams, and connections. Discussion of design requirements focuses on failure mechanisms and behavior, evaluation of existing components, and the process to develop economical steel member designs. Students complete a design project of a multi-story, steel, commercial building that is intended to synthesize the course material and create a realistic context for the course. Weekly assignments are typically derived from the course project.

Course Outcomes:

Student will be able to
1. Refer and use design codes and hand book for design of steel structural elements.
2. Determine the load carrying capacity of the sections for different actions.
3. Analyze the members for design loads.
4. Design steel structural members.
5. Design the connections.

Unit Wise Syllabus:

Unit			Hours
1	a	Introduction to Design of Steel Structures: Advantages & Disadvantages of steel as a structural material, permissible stresses, factor of safety, Methods of design, Types of connections, various types of standard rolled sections.	
	b	Introduction to Limit state Method: Basic concept of Limit state Method, analysis procedure and design philosophy, loads and load combinations, partial safety factors for loads and materials, comparison with working stress methods.	06
2		Tension members- common sections, behavior of tension members, modes of failure, load carrying capacity, design of angle sections in trusses, design of bolted and welded connections.	06

3		Compression members- common sections, modes of failure, classification of cross sections, load carrying capacity, design of angle sections in trusses. Design of bolted and welded connections.	
4	a	Columns: load carrying capacity of simple and built up sections, design of simple and built up sections. Design of Lacing and Battening.	
	b	Column Bases: Design of slab base, gusseted base.	06
5	a	Plastic theory- plastic hinge concept, plastic collapse load, plastic moment, shape factor, plastic section modulus.	06
	b	Design of beams- laterally restrained and unrestrained simply supported beams. Design of built up beams. Curtailment of flange plates	07
6		Gantry girder: Forces acting on gantry girder, commonly used sections, design of gantry girder as laterally unsupported beam.	05

Note: Use of IS: 800-2007, IS: 875-1987 and Hand Book No 1 (Steel Table) is permitted for examination.

Tutorials:

One hour per week is to be utilized for problem solving to ensure that the students have properly learnt the topics covered in the lectures. These shall include assignments, quiz, surprise tests etc.

References:

1. Dr. N. Subramanian, "Design of Steel Structures", Oxford University Press, New Delhi.
2. K. S. Sai Ram, "Design of Steel Structures".
3. Dr V. L. Shah and Veena Gore, "Limit State Design of Steel Structures",Structures Publication
4. M. R. Shiyekar, "Limit State Design in Structural Steel", PHI Learning
5. S.K.Duggal, "Design of Steel Structures", Tata Mc-GrawHill publishing company Ltd., New Delhi.
6. Dayaratnam, "Design of Steel Structures", Wheeler Publishing, New Delhi.
7. Ram Chandra, "Design of Steel Structures" Standard Book House, Vol. I & Vol. II New Delhi.
8. A.S.AryaandJ.L.Ajamani,NemchandandBros,"DesignofSteelStructures", Roorkee
9. Vazirani & Ratwani "Design of Steel Structures".
10. B.C.Punmia, Jain & Jain, "Design of Steel Structures",Laxmi Publication,New Delhi.
11. E.H.Gaylord and C.N. Gaylord, "Design of Steel Structures", Mc-GrawHill, New York.
12. J.E.Lothers, "Design in Structural Steel Structures", Prentice Hall New Jersy.

Third Year B. Tech. Civil Engineering – Sem. V
CE 3031: Soil Mechanics

Teaching Scheme					Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)		
					Max	Min for Passing		Max	Min for Passing	
3	--	--	3	ISE	20	40	40	--	--	
				UT 1	15					
				UT 2	15			--	--	
				ESE	50	40		--	--	

Course Description:

Main objectives of this course/subject are to understand and design the basic infrastructural facilities like foundation, earth retaining structure and embankments. In this course the civil engineer has many diverse and important encounters with soil. Soil mechanics is a branch of soil physics and engineering mechanics that describes the behavior of soils. It differs from fluid mechanics and solid mechanics in the sense that soils consist of a heterogeneous mixture of fluids (usually air and water) and particles (usually clay, silt and sand, and gravel) but soil may also contain organic solids and other matter. Along with rock mechanics, soil mechanics provides the theoretical basis for analysis in geotechnical engineering, a sub discipline of civil engineering, and engineering geology, a sub discipline of geology. Soil mechanics is used to analyze the deformations of and flow of fluids within natural and man-made structures that are supported on or made of soil, or structures that are buried in soils. Example applications are building and bridge foundations, retaining walls, dams, and buried pipeline systems. Principles of soil mechanics are also used in related disciplines such as engineering geology, geophysical engineering, coastal engineering, agricultural engineering, and hydrology and soil physics.

Course Outcomes:

After completing the course, the student should be able to: -

1. Describe the significance of the basic physical and mechanical properties of soils.
2. Demonstrate the experimental methods used to measure the soil behavior.
3. Compute an engineering classification of a given soil.
4. Recognize the basic fundamental soil mechanics principles underlying common Civil Engineering applications.
5. Estimate the engineering prosperities for various soils to solve geotechnical problems with come across in Civil Engineering, also with aware of more advanced techniques that is available for solving of problems.
6. Calculate water flow through ground, and understand the effects of seepage on the stability of structures.
7. Recognize the importance of professional, clear, concise technical reports and letters to clients and colleagues.

Unit Wise Syllabus:

UNITS		Hours
1	Introduction: History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships. Index Properties Of Soils: Water content, Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soils: Moisture content, Specific gravity, Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit- Casagrande and cone penetration methods, Plastic limit and shrinkage limit determination.	06
2	Classification of Soils: Purpose of soil classification, basis for soil classification, Particle size classification, IS classification. Unified soil classification (USC)and IS classification - Plasticity chart and its importance, Field identification of soils. Clay Mineralogy And Soil Structure: Single grained, honey combed, flocculent and dispersed structures Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.	06
3	Flow of Water Through Soils: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets	06
4	Effective Stress on Soil: concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena. Compaction of Soils: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control, Proctor needle. Compacting equipment's, Dynamic compaction, vibroflotation.	06
5	Consolidation of Soils: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation), Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Consolidation characteristics of soil (Cc, av, mv and Cv), Time rate of consolidation. Determination of coefficient of	06

consolidation by square root of time fitting method, logarithmic time fitting method.

| 6 | Shear Strength of Soils: Concept of shear strength, Mohr's strength theory, Mohr's-Coulomb theory, conventional and modified failure envelops, Total and effective shear strength parameters, Concept of pore pressure, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay. Measurement of shear parameters- Direct shear test, unconfined compression test, Triaxial compression test and vane shear test, Test under different drainage conditions. | 06 |

References:

1. Dr. K.R.Arora, " Soil mechanics and Foundation engineering", (Standard Publishers Distributers-Delhi)
2. B. C. Punmia , "Soil mechanics and Foundation engineering", (A Saurabh and Company Pvt. Ltd., Madras)
3. Murthy V.N.S., "Soil Mechanics and Foundation Engineering" UBS Publishers and Distributors, 4th Edition New Delhi (1996).
4. Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics" New Age International (P) Ltd., New Delhi(2000).
5. Dr. Alam Singh ,"Text book of soil mechanics in theory and practice" (Asian Publishing House, Bombay)
6. P. Purushottam Ra, "Geotechnical Engineering", (Tata Mcgraw Hill Company Ltd. New Delhi)
7. Terzaghi and Peak ,"Soil mechanics",(John Willey and Sons, New- York)
8. T. N. Ramamurthy ,"Geotechnical Engineering" (S Chand Publications, New Delhi)
9. B.J.Kasamalkar , "Geotechnical Engineering",(Pune Vidyarthi Griha Prakashan Pune)

Third Year B. Tech. Civil Engineering – Sem. V
CE 3051: Infrastructure Engineering- I

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
4	--	--	4	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Discription:

The Infrastructure Engineering-I will equip students to meet maintain ageing infrastructure, integrate new infrastructure into existing systems, and expand existing infrastructure important challenges. The program was developed in response to the growing need for engineers with advanced knowledge of the characteristics and significance of infrastructure, including its technological, economic and social impact.

Course Outcomes:

Student will be able to
1. Geometric design flexible and rigid pavement of road sections.
2. Design and construction of pavements.
3. Design and construction methods of tunnel.
4. Geometric design and construction methods of Airport.
5. Geometric design and construction methods of Docs and Harbors

Unit Wise Syllabus:

| Unit | | | Hours |

1 a **Geometric Design of Highways:**   **08**
   Factors affecting transportation. Highway financing; PPP, Requirements of geometric design, Factors affecting geometric design, Road classification, and Highway alignment: Requirements, Factors controlling alignment, Special consideration for hilly areas.

   b Cross sectional elements: Camber, Width of carriage way, Kerbs, Road margins, Width of formation, Right of way.

   c Sight distance, Horizontal alignment; Horizontal Curves, Super elevation, extra widening, set back distance. Vertical alignment; Gradient, Summit curve, Valley curve.

   d Pavement Material: Soil, Desired properties, tests. Aggregates: Desired properties, tests. Bitumen: Types, requirements and tests.

| 2 | a | **Pavement Design and construction:** | 08 |

2 a **Pavement Design and construction:**   08

Requirements of a pavement, Types of pavements, Failure of pavements, Factors affecting pavement design, Bituminous mix, Flexible pavement design (IRC method), Rigid Pavement design (Westergaard's Analysis), IRC-58 (2002) method of design. Joints in rigid pavement.

  b Introduction to traffic Engineering: Speed, Flow, and Density. Traffic signs, Requirements of traffic control devices. Road markings.

  c Road construction and Maintenance.

3   **Tunnel engineering:**   08

Introduction to tunnel engineering, shapes and applications, geological investigation, Shafts, Pilot tunnel, portals tube and twin tunnels. Tunnel construction using advanced methods (TBM and Shields). Tunnel components. Safety in tunneling.

4   **Airport Geometric Design:** Introduction to airport engineering, components of an aircraft, aircraft characteristics, Site selection VFR, IFR, Visual aids, airport lighting and marking. Runway orientation, wind rose, basic runway length, runway patterns. Taxiway Layout, exit taxiways. .   08

5   **Airport - construction and maintenance:**

Terminal Buildings, Aprons, Hangers, Pavement.

6   **Docks and Harbors**   08

Introduction, classification of ports and harbors, sites selection, Introduction to break waters, jetties, wharves, piers. Dock, navigational aids, lighthouses, terminal buildings, special equipment's.

References :

1 Khanna S.K. and C.E.G. Justo "Highway Engineering", Nem Chand & Bros., Roorkee(2000).

2 Khanna S.K., Arora M.G. and Jain S.S. " Airport Planning and Design", Nem Chand and Bros., Roorkee(1997).

3 Partha Chakroborty and Animesh Das "Principles of Transportation Engineering", Prentice-Hall India, New Delhi(2003).

4 Oza, "Dock and Harbor Engineering", Chartor pub. house

5 Shrinivasan, "Dock, Harbor and Tunnel Engineering",Chartor pub. house

6 Drew D.R. "Traffic Flow Theory and Control", McGraw-Hill, New York(1968).

7 Hutchinson B.G. "Principles of Urban Transport Systems Planning" McGraw-Hill Book Co, New York(1974).

8 McShane W.R. and Roess R.P. "Traffic Engineering", Prentice-Hall Inc., New Jersey(1990).

9 Horonjeff Robert: "The Planning and Design of Airports", McGraw Hill Co., New York.

10 IRC: 76-1979 – Tentative Guidelines for Structural Strength Evaluation of Rigid Airfield

Pavement, IRC, New Delhi.

11 IRC: 85-1983 – Code of Practice for Accelerated Strength Testing and Evaluation of Concrete Road and Air field Constructions, IRC, New Delhi.
12 IRC: 58-2002 (Second Revision) – Guidelines for the Design of Rigid Pavements for Highways, IRC, New Delhi.
13 IRC: 37-2001 – Guidelines for the Design of Flexible Pavements for Highways, IRC, New Delhi.
14 Yang H. Huang "Pavement Analysis and Design", Prentice-Hall (1993).

Third Year B. Tech. Civil Engineering – Sem. V
CE 3071: Water Supply Engineering

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

Water supply Engineering   is offered as the core course at the fifth semester of Civil Engineering undergraduate programme; consist of two modules –. The first module focuses on the water demand and water quality analysis, water treatment process and design. The Second module constitutes the transmission of water from source and distribution of treated water to community and maintenance of WDS as well as design of ESR & GSR.

Pre- Requisites: Students should have knowledge of Mathematics and statistical analysis background including network analysis, continuity equations.

This course intends to build the competency in the students to identify water source, to check water quality, to design of water supply scheme. Suggest and Implement solutions to enhance the water quality and efficiency of the water supply scheme..

Course Outcomes:

Student will be able to:
1. Explain Quality and Quantity of water.
2. Prepare to calculate Water requirement for domestic use.
3. Investigate water source and water treatment for various water quality parameters.
4. Design water supply scheme and water treatment plant.
5. Evaluate efficiency of water treatment units and distribution network.

Unit Wise Syllabus:

1 Sources of water, quantity & quality of sources, demand of water, factors affecting   **06** demand ,fluctuations in demand, rate of water consumption, design period & population forecast .Water quality parameters, characteristics & significance in water treatment, drinking water quality standards- BIS, WHO Standards. Intake Works - concept & design of Intake well, Jack well, Pumps & Rising mains.

2. Concept of water treatment Aeration- Types of aerators, design of cascade aerator Coagulation & Flocculation- factors affecting, destabilization of colloidal particles, types of dosing of coagulants, selection of coagulants, jar tests, design of rapid mixer & flocculator. Sedimentation- Theory, types of settling, types of sedimentation tanks, design principles & design, concept of tube & plate settler. Filtration- Mechanism, head loss development, negative head loss, Types of filters-Slow sand filter, Rapid sand filter, Multimedia & Pressure filter, operation & design of slow sand rapid sand filter, rate control patterns. **06**

3. Disinfection- Mechanism, factors affecting disinfection, methods of disinfection, chemistry of chlorination, chlorination practices, points of chlorination, application of chlorine, Water softening processes - lime-soda process, ion exchange. **06**
Demineralization - Reverse osmosis, ion exchange, electro dialysis. Salient features of rural water supply scheme, Sequencing of treatment for various qualities of surface & ground water.

4. Transmission of water, pumping & gravity mains, choice of pipe materials, forces acting on pressure pipes, leakage & pressure testing of pipes, thrust block design, corrosion types & control measures. **06**

5. Water distribution systems, method of distributing water, layout pattern, basic system requirements for water distribution system, methods of network analysis: equivalent pipe method, Hardy-Cross method, design problem, concept of Newton Rapson method. **06**

6. Water supply appurtenances- sluice valve, air relief valve, gate valve, non-return valve, scour valve, fire hydrants water meter, service connections, maintenance & leak detection of water distribution system. Distribution reservoirs & service storages- necessity, location, head requirement, capacity determination by analytical & graphical method. **06**

References:
1. Manual of water supply and treatment by Government of India publication Third Edition (2007)
2. Mark J. Hammer "Water and Waste water Technology" by John Wiely and Sons Publication. (2007).
3. M. L. Davis and Davis A "Introduction to Environmental Engineering", Mc Graw Hill publication Third Edition (1998)
4. T. H. McGhee "Water supply and Sewerage by McGraw-Hill Companies (2007)
5. G. M. Master Introduction to Environmental Engineering & Sciences Pearson Education Second edition (2007)
6. S. K. Garg Water Supply Engineering by , Khanna Publishers, New Delhi Second Edition (2007)
7. Dr. B. C. Punmia , Ashok kumar Jain and Dr. Arun kumar Jain "Water Supply Engineering" by, Laxmi Publishers, New Delhi , Second Edition (2016)
8. Dr. P. N. Modi "Water Supply Engineering" by, Standard Book House, New Delhi Third Edition 2010
9. Peavy, Rowe, and George Tchobanoglous " Environmental Engineering" by McGraw-Hill Publication ,New Delhi 1985

Third Year B. Tech. Civil Engineering – Sem. V
CE 3091: Engineering Management

Teaching Scheme				Evaluation Scheme					
				Scheme	Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits		Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

This course will provide an overview of the essential skills relevant to managing cross-disciplinary engineering and science-based teams in construction industries. Such teams are typically responsible for new project development, getting innovations to market, developing new technologies, implementing product improvement or establishing or improving organizational infrastructure. Students will focus on the fundamental skills and applications of engineering and science management and will be introduced to the relevant engineering topics to be successful in construction field.

Course Outcomes:

After successful completion of this subject students should be able to:-

1. Identify the need of project management for success of Civil engineering projects.
2. Develop and analyze the network diagram of civil engineering project.
3. Calculate optimum time and optimum cost of project through network compression.
4. Discuss computer based project management.
5. Analyze network diagram by precedence method.
6. Choose most economical alternative for civil engineering projects through various economic comparison methods.
7. Apply various techniques for inventory control.

Unit Wise Syllabus:

1. Principles of Management (by Henry Fayol)   (04)
   Functions of Management:
   a) Planning – Nature, Process and Importance of Planning,
   b) Organizing
   c) Staffing – Introduction
   d) Directing, Co-Ordination, Communication, Motivation and Controlling.

Levels of management,

Organizations-elements, types and characteristics

2.	Project Management – Objectives, Agencies, Phases; Work Breakdown Structure.	(08)

Project Planning - Bar Chart, Mile Stone Chart, CPM

Development of CPM Network – Time Estimates, Floats, Critical Path.

3.	Network Compression, Network Updating,	(06)

Resource allocation – smoothening and leveling

Introduction to PERT

Introduction to Computer based Project Management

4.	Precedence Network: Concept, Development of Precedence Network	(04)

Introduction to Work Study.

5.	Engineering Economics –	(08)

(a) Introduction, Importance.

(b) Time Value of Money, Equivalence, Tangible and Intangible Factors, Economic Comparisons-

(c) Present Worth Method, Equivalent Annual Cost Method, Capitalized Cost Method,Rate of Return, Benefit Cost Ratio, Payback Method

(d) Linear Break Even Analysis.

6.	Site Layout – Factor Affecting, Typical Layout of few Major Construction Projects	(06)

Material Management – Objectives, Functions

Inventory Control- Necessity, Techniques Such As ABC, EOQ Analysis, Safety Stocks.

References:

1 Harold Kerzner, " Project Management- A system approach to planning, scheduling and controlling", *CBS Publishers and Distributors,*Reprint Edition 2014, ISBN 978-81-265-3887-4

2 K. K. Chitkara, "Construction Project Management-Planning,Scheduling and Controlling", Tata McGraw-Hill Education, Reprint, ISBN0074620622

3 O. P. Khanna "Industrial Engineering and Management", 4th Edition, ISBN818992835X

4 Legand Blank & Anthony Tarquin, Basics of Engineering Economics", McGraw Hill Professional, 2005

5 R. Paneerselvam, "Engineering Economics", Second Edition October 2013, PHI Learning Private Limited

6 Gopal Krishnan, Abid Haleem, "Material Management", Second Edition 2015 PHI Learning Private Limited

7 Sandra Christensen Weber, "Scheduling Construction Projects" by, ISBN 978-81-317-8821-9 Pearson

8 Dr. B. C. Punmia & Khandelwal, "Project Planning, Scheduling and controlling by CPM/PERT", Fourth Edition Reprint 2008

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	50	50
				ESE	--	--	--	50	

Course Description:

Main objectives of this course/subject are to understand and design the basic infrastructural facilities like foundation, earth retaining structure and embankments. In this course the civil engineer has many diverse and important encounters with soil. Soil mechanics is a branch of soil physics and engineering mechanics that describes the behavior of soils. It differs from fluid mechanics and solid mechanics in the sense that soils consist of a heterogeneous mixture of fluids (usually air and water) and particles (usually clay, silt and sand, and gravel) but soil may also contain organic solids and other matter. Along with rock mechanics, soil mechanics provides the theoretical basis for analysis in geotechnical engineering, a sub discipline of civil engineering, and engineering geology, a sub discipline of geology. Soil mechanics is used to analyze the deformations of and flow of fluids within natural and man-made structures that are supported on or made of soil, or structures that are buried in soils. Example applications are building and bridge foundations, retaining walls, dams, and buried pipeline systems. Principles of soil mechanics are also used in related disciplines such as engineering geology, geophysical engineering, coastal engineering, agricultural engineering, and hydrology and soil physics.

Course Outcomes:

After completing the course, the student should be able to: -

1. Describe the significance of the basic physical and mechanical properties of soils.
2. Demonstrate the experimental methods used to measure the soil behavior.
3. Compute an engineering classification of a given soil.
4. Recognize the basic fundamental soil mechanics principles underlying common Civil Engineering applications.
5. Estimate the engineering prosperities for various soils to solve geotechnical problems with come across in Civil Engineering, also with aware of more advanced techniques that is available for solving of problems.
6. Calculate water flow through ground, and understand the effects of seepage on the stability of structures.
7. Recognize the importance of professional, clear, concise technical reports and letters to clients and colleagues.

Laboratory work:

Experiments

1. Field Density a) Core Cutter Method b) Sand Replacement Method
2. Specific Gravity of Soil Grains.
3. Grain Size Distribution a) Dry Analysis b) Wet Analysis
4. Consistency Limits a) Liquid Limit b) Plastic Limit c) Shrinkage Limit
5. Proctor Compaction Test
6. Permeability Test a) Constant Head method b) Falling Head method.
7. Direct Shear Test
8. Triaxial Test (UU)
9. Unconfined Compressive Strength Test (UCS)
10. One Dimensional Consolidation Test
11. California Bearing Ratio Test (CBR)

References :

1. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd. New Delhi.
2. Head K.H, "Manual of Soil Laboratory Testing" Princeton Press, - Vol. I, II, III, London (1986).
3. Bowles J.E., "Engineering Properties of Soil and Their Measurements McGraw Hill Book Co. New York (1988).
4. BIS Codes of Practice: IS 2720(Part-3/Sec. 1) 1987; IS 2720 (Part 2) -1973; IS 2720 (Part 4) 1985; IS 2720 (Part 5) 1985; IS 2720 (Part 6) 1972; IS 2720 (Part 7) 1980; IS 2720 (Part 8) 1983; IS 2720 (Part 17) 1986; IS 2720 (Part - 10) 1973; IS 2720 (Part 13) 1986; IS2720 (Part 11) 1971; IS2720 (Part 15) 1986; IS 2720 (Part 30) 1987; IS 2720 (Part 14) 1977; IS 2720 (Part 14) 1983; IS 2720 (Part 28) 1974; IS 2720 (Part 29) 1966, IS 2720 (Part-60) 1965.

Third Year B. Tech. Civil Engineering – Sem. V
CE 3131: Transportation Engineering Laboratory

Teaching Scheme					Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)		
					Max	Min for Passing		Max	Min for Passing	
--	--	2	1	ISE	--	--	--	50	50	
				ESE	--	--	--	50		

Course Description:

Engineering problems of transportation by highways, airways, pipelines, waterways, and railways. Transportation modes and technologies, vehicle dynamics, basic facility design, traffic stream models, capacity analysis, transportation planning, evaluation and choice, and network analysis.

Course Outcomes:

After completing the course, the student should be able to: -

1. Solve problems from highway pavement design.
2. Understand different d methods of testing of materials.
3. Differentiate physical properties of highway materials as per IRC.
4. Visit report based on live structure construction

Laboratory work:

Tests on Aggregates

    a) Specific Gravity and Water absorption Test

    b) Impact Test

    c) Abrasion Test

    d) Crushing strength Test

Test on Bituminous Materials

    a) Penetration Test

    b) Softening point test

    c) Flash and fire point test

    d) Ductility test

    e) Viscosity Test

    f) Marshall Stability Test

Assignments

    a) At least one Assignment on all Syllabuses.

    b) Field visit and Report.

References:

1   Khanna S.K. and C.E.G. Justo, " Highway Engineering", Nem Chand & Bros., Roorkee(2000).

2   Khanna S.K., Arora M.G. and Jain S.S. "Airport Planning and Design", Nem Chand and Bros., Roorkee(1997).

3   Partha Chakroborty and Animesh Das, "Principles of Transportation Engineering", Prentice-Hall India, New Delhi(2003).

4   Oza, "Dock and Harbor Engineering",Chartor pub. house

5   Shrinivasan,"Dock, Harbor and Tunnel Engineering",Chartor pub. house

6   Drew D.R. "Traffic Flow Theory and Control", McGraw-Hill, New York.

7   Hutchinson B.G, "Principles of Urban Transport Systems Planning. McGraw-Hill Book Co., New York(1974).

8   McShane W.R. and Roess R.P., "Traffic Engineering", Prentice-Hall Inc., New Jersey.

9   Horonjeff Robert, "The Planning and Design of Airports", McGraw Hill Co., New York.

10 IRC: 76-1979 – Tentative Guidelines for Structural Strength Evaluation of Rigid Airfield Pavement, IRC, New Delhi.

11 IRC: 85-1983 – Code of Practice for Accelerated Strength Testing and Evaluation of Concrete Road and Air field Constructions, IRC, New Delhi.

12 IRC: 58-2002 (Second Revision) – Guidelines for the Design of Rigid Pavements for Highways, IRC, New Delhi.

13 IRC: 37-2001 – Guidelines for the Design of Flexible Pavements for Highways, IRC, New Delhi.

14 Yang H. Huang, "Pavement Analysis and Design", Prentice-Hall(1993).

T. Y. B. Tech. Civil Engineering –Sem.- V
CE 3151: Engineering Management Lab

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	100	50

Course Description:

This course will provide an overview of the essential skills relevant to managing cross-disciplinary engineering and science-based teams in construction industries. Such teams are typically responsible for new project development, getting innovations to market, developing new technologies, implementing product improvement or establishing or improving organizational infrastructure. Students will focus on the fundamental skills and applications of engineering and science management and will be introduced to the relevant engineering topics to be successful in construction field.

Course Outcomes:

After successful completion of this subject students should be able to:-
1. Identify the need of project management for success of Civil engineering projects.
2. Develop and analyze the network diagram of civil engineering project.
3. Calculate optimum time and optimum cost of project through network compression.
4. Discuss computer based project management.
5. Analyze network diagram by precedence method.
6. Choose most economical alternative for civil engineering projects through various economic comparison methods.
7. Apply various techniques for inventory control.

Detailed Practical Plan:

1. Practical No.01
   Assignment based on drawing of organization chart, Functions of management
2. Practical No.02
   Preparation of Bar charts for at least three civil engineering projects.
3. Practical No.03
   Preparation of Network diagram for any one of civil engineering project.
4. Practical No.04
   Problems on Network analysis, float calculations.
5. Practical No.05
   Problems on Network Compression.

6. Practical No.06
   Problems based on resource allocation
   Problems based on updating of network
7. Practical No.07
   Problems based on precedence network
8. Practical No.08
   Problems based on Economic Comparisons of projects at least two problems on each type.Engineering Economics comparison methods- Problems of Present worth method, Problems of Equivalent Annual Cost method,
9. Practical No.09
   Problems based on Economic Comparisons of projects at least two problems on each type.Engineering Economics comparison methods- Problems of Capitalized cost Method. Problems on Rate of Return
10. Practical No.10
    Problems based on Economic Comparisons of projects at least two problems on each type.Problems of Benefit-Cost Ratio, Payback Method, Break even analysis
11. Practical No.11
    Visit report covering Project Management and Site Layout
12. Practical No.12
    Problems on EOQ analysis

References:

1 Harold Kerzner, " Project Management- A system approach to planning, scheduling and controlling", *CBS Publishers and Distributors,*Reprint Edition 2014, ISBN 978-81-265-3887-4
2 K. K. Chitkara, "Construction Project Management-Planning,Scheduling and Controlling", Tata McGraw-Hill Education, Reprint, ISBN0074620622
3 O. P. Khanna "Industrial Engineering and Management", 4th Edition, ISBN818992835X
4 Legand Blank & Anthony Tarquin, Basics of Engineering Economics", McGraw Hill Professional, 2005
5 R. Paneerselvam, "Engineering Economics", Second Edition October 2013, PHI Learning Private Limited
6 Gopal Krishnan, Abid Haleem, "Material Management", Second Edition 2015 PHI Learning Private Limited
7 Sandra Christensen Weber, "Scheduling Construction Projects" by, ISBN 978-81-317-8821-9 Pearson
8 Dr. B. C. Punmia & Khandelwal, "Project Planning, Scheduling and controlling by CPM/PERT", Fourth Edition Reprint 2008

CE 3171: Water Supply Engineering Laboratory

Teaching Scheme					Evaluation Scheme				
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	100	50

Course Description

Water supply Engineering is offered as the core course at the fifth semester of Civil Engineering undergraduate programme; consist of two modules –. The first module focuses on the water demand and water quality analysis, water treatment process and design. The Second module constitutes the transmission of water from source and distribution of treated water to community and maintenance of WDS as well as design of ESR & GSR.

Pre- Requisites:

Students should have knowledge of Mathematics and statistical analysis background including network analysis, continuity equations. This course intends to build the competency in the students to identify water source, to check water quality, to design of water supply scheme. Suggest and Implement solutions to enhance the water quality and efficiency of the water supply scheme.

Course Outcomes:

Student will be able to
1. Explain Quality and Quantity of water.
2. Prepare to calculate Water requirement for domestic use.
3. Investigate water source and water treatment for various water quality parameters.
4. Design water supply scheme and water treatment plant.
5. Evaluate efficiency of water treatment units and distribution network.

Laboratory Work:

1	Part A	Analysis of any 10 of the following test parameters for water
	i	pH
	ii	Acidity
	iii	Alkalinity
	iv	Chlorides content
	v	Hardness – Total, temporary and permanent
	vi	Turbidity
	vii	Residual Chlorine
	viii	Total dissolved solids through measurement of electrical conductivity
	ix	Dissolved Oxygen
	x	Most Probable Number
	xi	Optimum dose of alum by jar test.

	xii	Fluorides & Nitrogen
	xiii	Iron and Manganese
2	**Part B**	Design/ Analysis problems on water treatment unit & distribution system.
3	**Part C**	Visit to a water treatment plant
4	**Part D**	Introduction to software and modeling

References:

1. Manual of water supply and treatment by Government of India publication Third Edition (2007).
2. Mark J. Hammer "Water and Waste water Technology" by John Wiely and Sons Publication. (2007).
3. M. L. Davis and Davis A "Introduction to Environmental Engineering",Mc Graw Hill publication Third Edition (1998).
4. T. H. McGhee "Water supply and Sewerage by McGraw-Hill Companies (2007).
5. G. M. Master Introduction to Environmental Engineering & Sciences Pearson Education Second edition (2007).
6. S. K. Garg Water Supply Engineering by , Khanna Publishers, New Delhi Second Edition (2007).
7. Dr. B. C. Punmia , Ashok kumar Jain and Dr. Arun kumar Jain "Water Supply Engineering" by, Laxmi Publishers, New Delhi , Second Edition (2016).
8. Dr. P. N. Modi "Water Supply Engineering" by, Standard Book House, New Delhi Third Edition 2010.
9. Peavy, Rowe, and George Tchobanoglous " Environmental Engineering" by McGraw-Hill Publication ,New Delhi 1985

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)

Third Year Engineering UG Programme

Course Code: SH3191 **Course Title: Aptitude Training-I**

Teaching Scheme:

L	T	P	C
1	0	2	2

Evaluation Scheme: ISE- 50% ESE- 50% (Minimum Passing Marks: 40%)

Details of the Content		
SECTION	**DETAILS**	**Hrs.**
1. BASIC APTITUDE	• Percentage • Average • Ratio-proportion/fraction • Lcm & its applications	14
2. BUSINESS APTITUDE	• Profit & loss • Simple interest • Compound interest	10
3. RELATIVE SPEED	• Speed time & distance • Trains • Boats & streams • Races	14
4. TRW	• Time rate & work • Pipes & cisterns	07
	Total Hrs.	45

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S Chand Publishing, New Delhi

2. R. S. Aggarwal, "Logical Reasoning", S Chand Publishing, New Delhi

3. Arun Sharma, "Quantitative Aptitude", McGraw Hill Publishing, New Delhi 7th Edition

4. Arun Sharma, "Logical Reasoning", McGraw Hill Publishing, New Delhi 3rd Edition

Course Learning Outcomes:

After successful completion of the course student will be able to solve aptitude problems within stipulated time with appropriate logic.

Evaluation Method:

Four tests (preferably online) will be conducted as a part of ISE.
ESE will be of 50 marks covering the entire syllabus.

Third Year B. Tech. – Sem. VI

Course Code	Course	Teaching Scheme				Evaluation Scheme					
		L	T	P	Cr	Scheme	Theory (Marks %)		Practical (Marks %)	
							Max	Min. for passing	Max	Min. for passing
CE3021	Theory of Structures	3	1	--	4	ISE	20		-	--
						UT 1	15	40		
						UT 2	15			
						ESE	50	40		
CE3041	Foundation Engineering	3	1	-	4	ISE	20		-	-
						UT 1	15	40		
						UT 2	15			
						ESE	50	40		
CE3061	Estimating and Costing	3	--	--	3	ISE	20		--	--
						UT 1	15	40		
						UT 2	15			
						ESE	50	40		
CE3081	Concrete Technology	3	-	--	3	ISE	20		-	--
						UT 1	15	40		
						UT 2	15			
						ESE	50	40		
CE3101	Wastewater Engineering	3	1	-	4	ISE	20		-	-
						UT 1	15	40		
						UT 2	15			
						ESE	50	40		
CE3121	Estimating and Costing lab I	-	-	2	1	ISE	-	-	50	50
						ESE	-		50	50
CE3141	Design of Steel Structures Lab	-	--	4	2	ISE	-	-	50	50
						ESE	-		50	50
CE3161	Concrete Technology Lab	-	-	2	1	ISE	-	-	100	50
CE3181	Mini Project	--	--	2	1	ISE	-	-	100	50
CE3201	Industry internship*	--	--	--	1	ISE	-	-	100	50
SH3221	Scholastic Aptitude II (Audit Course)	--	--	--	-	ISE	-	-	40	40
						ESE			40	40
	TOTAL	15	3	10	24					

Total Contact Hours/week : 28

Total Credits   : 24

* Industry internship work of six week shall start at the end of the semester V and will be assessed at the end of semester VI of Third Year B. Tech.

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3021: Theory of Structures

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	1	--	4	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description
Analysis of determinate structures; Stability and determinacy; Influence lines and moving loads; Deflection methods. Analysis of indeterminate structures using the methods of compatibility of displacements; Slope-deflection method; Moment distribution method.

Course Outcomes:
After successful completion of this course, the students should be able to;
1. Analyse the indeterminate beams by using consistent deformation method
2. Analyse the indeterminate beams by using three moment theorem
3. Analyse the beam, truss, portal frame and two hinged arches by using energy method and Construct BMD
4. Analyse the continuous beam, portal frames by slope deflection method & construct BMD and SFD
5. Analyse the continuous beam, portal frames by moment distribution method & construct SFD and BMD
6. Analyse the continuous beam, portal frames by flexibility and stiffness matrix method & construct BMD

Unit Wise Syllabus:
1. Concept of degree of static and kinematic indeterminacy, degree of freedom, Consistent deformation method- fixed beam and propped cantilever with uniform section, yielding of support.   6
2. Clayperon's theorem of three moment, application to statically indeterminate beam, sinking of support, beam with different M.I.   6
3. Energy Theorems: Maxwell's reciprocal theorem, Castigliano's theorem, statically indeterminate beam, truss, portal frame, two hinged parabolic arch.   6
4. Slope deflection equation method: Modified slope deflection equation, sinking of support, application to beam, portal frame without and with sway. (Involving not more than two unknowns)   6
5. Moment distribution method: Sinking of support, application to beam, portal frame without and with sway. (Involving not more than two unknowns)   6

6 Flexibility method: flexibility coefficients, development of flexibility matrix, analysis **6** of beam and portal frame (Involving not more than two unknowns)
Stiffness method: stiffness coefficients. development of stiffness matrix, analysis of beam and portal frame (Involving not more than two unknowns)

Tutorial

One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, open book test, surprise test, declared test, seminar, final orals performance and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester

References:

1. C.S. Reddy " Basic Structural Analysis" Tata McGraw Hill Publishing House, New Delhi.
2. S. B. Junnarkar H.J. Shah "Mechanics of Structures (Vol-I and II)", Charotar Publishers.
3. L.S. Negi and R.S. Jangid " Structural Analysis", Tata Mc-Graw Hills Publishing House, New Delhi.
4. Vazirani and Ratwani , "Analysis of Structures: Vol. I & II", Khanna Publishers, New Delhi.
5. S.S.Bhavikatti, "Structural Analysis-II", Vikas Publishing House Pvt, ltd.
6. Devdas Menon , "Structural Analysis", Narosa Publishing House.
7. K.U. Muthu, Azmi Ibrahim, M. Vijyan, Maganti Janadharn, "Basic Structural Analysis" I.K. International Publishing House Pvt. Ltd.
8. G.S. Pandit &S.P. Gupta, "Structural Analysis- Matrix approach" Tata Mc-Graw Hills pub.
9. Gere & Weaver, "Matrix analysis of structures", CBS Publishing, New Delhi.
10. S.Ramamruthum , "Theory of Structures", Dhanpatrai & Sons pub., New Delhi.
11. R.S.Khurmi , "Theory of Structures",S. Chand & Co., New Delhi.

CE 3041: Foundation Engineering

Teaching Scheme					Evaluation Scheme				
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
3	1	--	4	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

A foundation is the element of an architectural structure which connects it to the ground, and transfers loads from the structure to the ground. Foundations are generally considered either shallow or deep. Foundation engineering is the application of soil mechanics and rock mechanics (Geotechnical engineering) in the design of foundation elements of structures.

Shallow foundations, often called footings, are usually embedded about a meter or so into soil. One common type is the spread footing which consists of strips or pads of concrete which extend below the frost line and transfer the weight from walls and columns to the soil or bedrock.

Prerequisites

1. Soil Mechanics.
2. Fluid Mechanics.
3. Engineering Mechanics.

Course Outcomes:
After completing the course, the student should be able to: -
1. Define scope and importance of Foundation Engineering for Civil Engineering practices.
2. Evaluate the bearing capacity analysis of shallow and deep foundations.
3. Practice of identifying the different types of foundations on various types of soils
4. Reproduce the soil investigation for various soils by using different methods.
5. Describe the determination of strength parameters for the design of foundation in practices.
6. Design of settlement analysis of foundations.

Unit Wise Syllabus:

1   Subsurface Exploration: Importance of exploration program, Methods of **06** exploration: Boring, sounding tests, geophysical methods- Electrical resistivity and Seismic refraction methods. Types of samples- undisturbed, disturbed and representative samples Samplers, sample disturbance, area ratio, Recovery ratio, clearance Stabilization of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

2   Bearing Capacity: Definitions of ultimate, net and safe bearing capacities, Allowable **06** bearing pressure. Modes of failure. Terzaghi's and Brinch Rankine's approach, Hansen's bearing capacity equations-assumptions and limitations Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Performance of footings in different soils, Vesic's chart, ultimate bearing capacity in case of local shear failure. Plate load test with reference to IS1888, Standard penetration test, cone penetration test.

3   Foundation Settlement: Settlement Analysis, Data for settlement analysis, **06** computation of settlement, Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance. BIS specifications for total and differential settlements of footings and rafts. Predominant settlement in granular soil, inorganic clays and organic soil.

4   Shallow Foundation: definition of shallow foundation, types and there selection, **06** General requirements of foundations- location and depth criterion, shear failure criterion or bearing capacity criterion, settlement criterion. Assumptions and limitations of design analysis. Design of isolated, combined, strap footing, Raft foundation, concept of floating foundation

5   Pile Foundation: definition of pile, necessity of pile foundation, types of piles. Load **06** transfer mechanism of pile. Load carrying capacity of piles- by static method - piles in granular soils, concept of critical depth, piles in clay. Group action of piles, ultimate load capacity of pile groups. Negative skin friction, Settlement of single and group of piles.

6   Stability of Earth Slopes: Introduction, Types of slopes, causes and type of failure of **06** slopes. Definition of factor of safety, Stability of finite and infinite slopes- Method of slices, Friction Circle method, Fellineous method, Taylor's stability number.

Tutorial:

One hour per week is to be utilized for problem solving to ensure that the students have properly understood the topics covered in the lectures. This shall include assignments, quiz, surprise tests etc.

References:

1) Alam Singh and Chowdhary G.R , "Soil Engineering in Theory and Practice", CBS Publishers and Distributors Ltd., NewDelhi 1994.

2) Punmia B.C. "Soil Mechanics and Foundation Engg", Laxmi Publications Co. , New Delhi , 16th Edition 2005.

3) B.J. Kasamalkar,"Foundation Engineering", Pune Vidyarthi Griha Prakashan Pune.

4) Bowles J.E."Foundation Analysis and Design", McGraw Hill Pub. Co. New York, 5th Edition 1996.

5) Murthy V.N.S.,"Soil Mechanics and Foundation Engineering", UBS Publishers and Distributors, New Delhi, 4th Edition, 1996.

6) K.R. Arora,"Soil Mechanics and Foundation Engg.", Standard Publishers Distributers -Delhi

7) Gopal Ranjan and Rao A.S.R.,"Basic and Applied Soil Mechanics",New Age International (P) Ltd., New Delhi, 2000.

8) Venkatrahmaiah C.,"Geotechnical Engineering", New Age International (P) Ltd., New Delhi, 3rd Edition, 2006.

9) Dr. N.V. Nayak ,"Foundation design manual",Dhanpat Rai and Sons.

10) Craig R.F.,"Soil Mechanics", Van Nostrand Reinhold Co. Ltd, 1987.

11) Braja M. Das,"Principles of Geotechnical Engineering",Thomson Business Information India (P) Ltd., India, 5th Edition, 2002.

12) Iqbal H. Khan ,"Text Book of Geotechnical Engineering", PHI, India, 2nd Edition, 2005.

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3061: Estimating Costing

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

Principles of construction cost estimating of the related materials, labor, and machines. The techniques of calculations to be applied to the wide variety of construction projects, housing, and commercials.

Course Outcomes:

After completing the course, the student should be able to: -

1. Understand the types and basic requirements of detail estimate.
2. Know administrative approval and technical sanction of estimates.
3. Realize general and detailed specifications for various construction items.
4. Develop estimate of residential buildings, public building etc.
5. Learn rate analysis of different construction items.
6. Understand PWD accounts & procedure.

Unit Wise Syllabus:

1 a General introduction to Quantity surveying– purpose of estimates. Types of estimates, various items to be included in estimates. Principles in selecting Units of measurement for items, various Units and modes of measurement for different trades, administrative approvalandtechnicalsanctiontoestimates.I.S.1200, Prime provisional sums and provisional quantities cost, **05**

2 a Introduction to D.S.R.

   b Specification-purpose and basic principle of general and detailed specification

   c Types of Estimates- Approximate, Detailed, Revised, Supplementary, Annual Repairs & maintenance, purpose, various methods used for buildings and other civil engineering works such as bridge, water supply, drainage, road project, school buildings, industrial sheds. **06**

   d Taking out quantity– Long-wall, short-wall, centerline method, Measurement and abstract sheets and recording.

3 a Detailed estimate of load bearing structure RCC structures. **07**

	b	Estimate of Roads and Canal	
	c	Estimate of culvert.	
4	a	Analysis of rates, factors affecting the cost of materials, labour. Task work, schedule as basis of labour costs. Plants and equipment-hour costs based on total costs and outputs. Transports, Overhead charges, rates for various items of construction of civil engineering works. Standard schedule of rate, price escalation.	**06**
5	a	Schedule of Reinforcement.	**05**
	b	Preparation of bar bending schedule for beams, columns, slabs, staircase, footing , lintel, chajja etc.	
6		PWD accounts & procedure, Organisation of engineering department. department methods of carrying out work- daily labour muster roll system, stores-unstamped receipt, accounting procedure of stores, classes of stores, reserved limit of stock, issue rate, subheads of stock, indent. stock accounting. Daily reports maintained on site.	**07**

References:

1   P.L. Bhasin.,"Quantity Surveying",S. Chand & Co- Ramnagar, Delhi-110055
2   S.C. Rangwala,"Elements of Estimating and Costing",. Charotar
    Publishing house- Opp Amul Dairy Courtroad Anand.388001 (westrly) India
3   B.S.Patil.,"Civil Engineering Contracts and Estimates", Universities Press Private Ltd.3-5-819 Hyderguda, Hyderabad. 500029,(A.P), India.
4   B. N. Dutta. ,"Estimating and Costing", Dhanpat Rai & Sons.1682, Nai Sarak, Delhi-110006
5   Birdi ,"Estimating and Costing", DhanpatRai & Sons1682, Nai Sarak, Delhi-110006
6   ChakrobortyM ,"Estimating, Costing and   Specification   in   civil engineering–.21b, Bhabananda Road, Kolkata-700026
7   S.C. Rangwala,"Valuation of real Properties", Charotar Publishing House –opposite Amuldairy, courtRoad Anand. 388001.India
8   "Standard specifications Volumes I & II (P.W.D. Maharashtra) Govt. of Maharashtra.
9   C.P.W.D. specifications
10 C.P.W.D. schedule of rates.

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3081: Concrete Technology

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

Mineral aggregates; properties and testing. Portland Cement; manufacturing, composition, hydration, properties and testing. Proportioning concrete Mixes. Mechanical properties and testing of hardened concrete. Masonry, manufacturing and testing. Manufacturing, properties, and testing of steel. Metals materials manufacturing and classification.

Course Outcomes:

After completing the course, the student should be able to: -

1. Explain the properties of different materials used in the manufacture of different kinds of concretes and role played them in developing strong, durable concretes.
2. Describe properties of various types of concretes in fresh and hardened state.
3. Design the concrete mixes of given grade by following mix design procedures recommended by IS Code and ACI code.
4. Evaluate the quality of concrete or concrete elements by adopting appropriate equipment's and techniques of Non Destructive Testing (NDT).
5. Illustrate various mechanisms causing the deterioration of concrete or concrete structures.
6. Describe the properties of special types of concretes based on their material composition and method of manufacture.

Unit Wise Syllabus:

1 Ingredients of concrete : Cement, fine aggregates, coarse aggregates, cementitious   **06**
   materials – fly ash, micro silica, ggbfs, metkaolin etc.
2 Properties of concrete (Fresh & Hardened): Fresh concrete properties – workability –   **06**
   different methods, Compressive strength, Flexural strength, Split tensile strengths
3 Statistically quality control Standard Deviation etc. Mix design and Quality control of   **06**
   concrete, Mix Design methods-IS & ACI
4 Special concretes: High strength concrete, high performance concrete, self-compacting   **06**
   concrete, fibre reinforced concrete.
   Formwork- Materials, types, construction of formwork, methods of removal
5 Non Destructing Testing of Concrete: Schmidt's rebound hammer, Ultrasonic pulse   **06**

velocity, Repairs and maintenance of concretes

| 6 | Durability of concrete: Strength & durability relationship, Volume change in concrete, Impact of w/c ratio on durability, permeability, chemical attack on concrete, Corrosion of steel in concrete. | **06** |

References:

1 M.S. Shetty , "Concrete Technology",S. Chand & Company Ltd, New Delhi), 2008.
2 M.L. Gambhir "Concrete Technology",Tata Mc Graw-Hill Publishing Company Ltd. New Delhi, 2005.
3 A.M. Neville,"Concrete Technology", Pearson Education, New Delhi.
4 Orchard ,"Concrete Technology",Asia publication, New Delhi.
5 A.R. Santhakumar,"Concrete Technology",Oxford University Press Publication, India, 2009.
6 N. Krishna Raju, "Design of concrete Mixes", CBS Publishers & Distributors, New Delhi, 2006.
7 S. P. Shah, and S. H. Ahmad, "High Performance Concrete: Properties and Applications", Mc-Graw-Hill Inc. Pub., New York, 1994.
8 Aitcin, P.C., E & FN Spon ,"High Performance Concrete: Properties and Applications", London, 1998
9 M.A. Caldarone, "High Strength Concrete A Practical Guide", Taylor and Francis Publication, London, 2009.
10 "Indian standard code of practice for plain and reinforced concrete", IS 456: 2000. *Bureau of Indian Standards,* New Delhi.
11 "Indian Standard Concrete Mix Proportioning – Guidelines", IS 10262-2009, *Bureau of Indian Standards*, New Delhi.
12 "Indian Standard Methods of Sampling and Analysis of Concrete", IS 1199-1959, *Bureau of Indian Standards*, New Delhi.
13 "Indian Standard Methods of Tests for Strength of Concrete". IS: 516–1959. *Bureau of Indian Standards*, New Delhi.
14 "Indian Standard Recommended Guidelines of Concrete Mix Design", IS: 10262-1982, *Bureau of Indian Standards*, New Delhi
15 "Indian Standard Specification for Coarse and fine aggregates from natural sources for concrete", IS 383-1970, *Bureau of Indian Standards*, New Delhi.

Teaching Scheme					Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)		
					Max	Min for Passing		Max	Min for Passing	
3	1	--	4	ISE	20	40	40	--	--	
				UT 1	15					
				UT 2	15			--	--	
				ESE	50	40		--	--	

Course Description

Wastewater Engineering is offered as the core course at the sixth semester of T.Y. B. Tech (Civil Engineering) undergraduate programme; It consist of two modules –. The first module focuses on the wastewater collection and wastewater quality analysis, wastewater treatment process and design. The Second module consists of waste disposal methods , low cost wastewater treatment systems and emerging technologies in wastewater treatment.

Course Outcomes :

Student will be able to

1. Explain importance of wastewater analysis for different parameters and suggest the treatment required.
2. Classify various treatment technology used for wastewater treatment.
3. Design sewerage system and wastewater treatment plant (STP) for domestic wastewater.
4. Suggest method for disposal of wastewater
5. Explain Emerging Technologies for Waste Water Treatment

Prerequisite :

For this course is a mathematical and statistical analysis background including network analysis, continuity equations .Should have a clear understanding of the quality & quantity of wastewater ,importance of wastewater recycling, working of wastewater treatment plant .

This course intends to build the competency in the students to identify wastewater source, to check wastewater quality, to design of wastewater treatment plant. Suggest and Implement solutions to enhance the wastewater quality and efficiency of the wastewater treatment systems. In this course student should study recent technologies in wastewater.
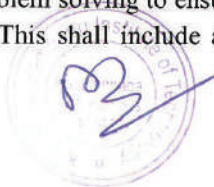
Unit Wise Syllabus:

1 Introduction Objective, Basic design considerations like Engineering, Environmental,   **06**
process and cost, flow diagrams, design period, population Forecasting.
Characteristics of wastewater Physical, Chemical and Biological characteristics.
Waste water sampling and analysis, interpretation and practical Significance of test
results. Important microorganisms in wastewater and their importance in wastewater
treatment system.
River Sanitation
Self-purification of natural streams, Stream standards, effluents Standards, Oxygen Sag
Curve

2 Sewerage Flow   **06**
Sources of sewage, Variations in sewage flow, storm-water runoff, ground water
infiltration. Design of sanitary sewers, Minimum size of sewer, velocities in sewers and
gradient of sewers.
Sewer appurtenances i.e. manholes, street inlets, flushing devices, Vent pipes etc.
pumping of sewage, types of pumps for sewage pumping.

3 Wastewater Treatment
Theory and design of primary treatment units.   **06**
Screens: Types of screens, design of screen chamber, disposal of Screenings.
Grit Chamber: Sources of grit, velocity control in grit chamber, design of grit
chambers including proportional flow weir, disposal of grit, Sources of oil and grease,
importance of removal, methods of oil and grease removal, design of skimming tanks.
Primary Sedimentation:
Necessity, design of PST with inlet and outlet details, Primary
Sludge and its disposal

4 Theory and Design of Aerobic Secondary Treatment Units
Activated sludge Process: Biological principle, modification of ASP, sludge volume   **06**
index, sludge bulking and control.
Trickling filter and Rotating Biological Contactor.
Low Cost Treatment methods:
Oxidation pond. Aerated Lagoons, Oxidation Ditches: Effluent disposal and reuse,

5 Theory and Design of Anaerobic Treatment Units
Principle and Design of Septic tanks, Anaerobic Digester, Sludge disposal methods,   **06**

6 Emerging Technologies for Waste Water Treatment
Decentralized Wastewater Treatment,- Root zone Technology , Constructed wastelands,   **06**
Duckweed ponds Fluidized aerobic bed technology ,Up flow sludge Blanket Reactors
(UASBR), Sequential Batch Reactor, MBR, MMBR, live case study

Tutorials:

One hour per week is to be utilized for problem solving to ensure that the student have properly
learnt the topics covered in the lectures. This shall include assignments, quiz, surprise tests,
software etc.

References:

1   Peavey, H. S. Rowe, D.R., Environmental Engineering, McGraw-Hill Book Company 1985.
2   P. N. Modi, Waste water Engineering,. Standard Book House, New Delhi. 2011,Third Edition
3   Viessman W. and Hammer M.J. Water supply and pollution Control, Harper Collins College publishers 1993 Sixth Edition..
4   Hammer M.J. Water and Waste water Technology, Prentice-Hall of India Private Limited.1995 Second Edition.
5   G. S. Birdie ,Water Supply & Sanitary Engineering, , Dhanpat Rai & Sons, New Delhi 2014.
6   Manual on sewerage and sewage Treatment Government of India Publication.2008.
7   G. M. Master Introduction to Environmental Engineering & Sciences Pearson Education 2007 Second edition.
8   Metcalf and Eddy ,, Wastewater Engineering treatment and Disposal, Tata Mcgraw-hill publication, New Delhi Third Edition 2003

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3121: Estimating and Costing Laboratory I

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	50	50
				ESE	--	--		50	50

Course Description

Principles of construction cost estimating of the related materials, labor, and machines. The techniques of calculations to be applied to the wide variety of construction projects, housing, and commercials.

Course Outcomes:

After completing the course, the student should be able to: -

1. Understand the types and basic requirements of detail estimate.
2. Know administrative approval and technical sanction of estimates.
3. Realize general and detailed specifications for various construction items.
4. Develop estimate of residential buildings, public building etc.
5. Learn rate analysis of different construction items.
6. Understand PWD accounts & procedure

Laboratory Work:

1 Assignment based on comparison of market rates and D. S. R. rates of material and labour. Preparation of Bar charts for at least three civil engineering projects.
2 Finding out quantities of different building items of existing building by taking actual measurement.
3 Detailed estimate for single story residential building
4 Preparation of bar bending schedule of different building components such as slab, beam, column, staircase, lintel , chajja etc
5 Preparing detailed estimate for any one of the following:
   a. Astretchofaroadabout1Km.longincludingearthwork.
   b. Areachofcanalabout1Km.long.
   c. A factory shed of steel frame.
   d. Culvert
6 Preparation of running bill and final bill of any one civil engg. Structure
7 Detailed specification for minimum five civil engineering items. (One each from Roads, Irrigation works, Water Supply & Sanitation & three from buildings)

8 Rate Analysis of seven civil engineering items.

Use of software for preparation of estimate is desirable.

References:

1 P.L.Bhasin. ,"Quantity Surveying", S. Chand & Co-Ramnagar, Delhi-110055
2 S.C. Rangwala ,"Elements of Estimating and Costing",. Charotar Publishinghouse-OppAmulDairyCourtroadAnand.388001(westrly)Indi
3 B.S.Patil ,"Civil Engineering ContractsandEstimates".UniversitiesPressPrivateLtd.3-5819Hyderguda,Hyderabad.500029,(A.P),India.
4 B. N. Dutta,"Estimating and Costing",.DhanpatRai&Sons.1682,NaiSarak,Delhi-110006
5 Birdi ,"EstimatingandCosting", DhanpatRai&Sons1682,NaiSarak,Delhi-110006
6 ChakrobortyM ,"Estimating, Costing   and   Specification in   civil engineering",.21b,BhabanandaRoad,Kolkata-700026
7 S.C.Rangwala   ,"ValuationofrealProperties"   CharotarPublishingHouse-oppositeAmuldairy,courtRoadAnand.388001.India
8 "Standard specifications Volumes I & II ",(P.W.D. Maharashtra) Govt. of Maharashtra.
9 C.P.W.D. specifications
10 C.P.W.D. schedule of rates.

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3141: Design of Steel Structures Laboratory

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	4	2	ISE	--	--	--	50	50
				ESE	--	--		50	50

Course Description

This course covers the following topics: This course is designed to introduce the behaviour and design of steel structural members according to the limit states design concept. The behaviour and design of tension members, compression members, laterally restrained and unrestrained beams, beam-columns and design of connections will be discussed. Students are expected to obtain basic knowledge about the design and failure mode of steel structural members after finished this course

Course Outcomes:

After completing the course, the student should be able to: -

1. Analyse and design the members of steel structures manually.
2. Analyse and design members and structure as a whole using any standard software.
3. Interpret the results obtained from the software.

Laboratory work consists of detailed structural design and drawing of the following steel structures.

1. Industrial Shed:
Roof truss, Gantry girder, Columns, Column bases.

2. Any one of the following:

(a) Building Frame:
Secondary and main beams, column and column bases, beam- to- beam connection, column-beam connection, design of typical members.

(b) Foot Bridge:
Influence lines, cross beam, main truss, raker, joint details, support details.

(c) Welded Plate Girder:

Note: Analysis results of the first problem shall be compared with the results by any standard software package.

References:

1. Dr. N. Subramanian, "Design of Steel Structures", Oxford University Press, New Delhi.
2. K. S. Sai Ram, "Design of Steel Structures", Pearson
3. "Limit State Design of Steel Structures",Dr V. L. Shah and Veena Gore, Structures Publications
4. M. R. Shiyekar ,"Limit State Design in Structural Steel", , PHI Learning
5. S. K. Duggal, "Design of Steel Structures", Tata Mc-Graw Hill publishing company Ltd., New Delhi.
6. Dayaratnam, "Design of Steel Structures", Wheeler Publishing, New Delhi.
7. Ram Chandra, "Design of Steel Structures",Vol. I & Vol. II - Standard Book House, New Delhi.
8. A.S.Arya and J.L. Ajamani, "Design of Steel Structures", Nemchand and Bros., Roorkee
9. Vazirani & Ratwani. "Design of Steel Structures",
10. B.C.Punmia, Jain & Jain "Design of Steel Structures", Laxmi Publication, New Delhi.
11. ",E.H.Gaylord and C.N. "Design of Steel Structures",Gaylord, Mc-Graw Hill, NewYork.
12. J.E.Lothers, "Design in Structural Steel Structures", Prentice Hall New Jersy.

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3161: Concrete Technology Laboratory

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	100	50

Course Description

Mineral aggregates; properties and testing. Portland Cement; manufacturing, composition, hydration, properties and testing. Proportioning concrete Mixes. Mechanical properties and testing of hardened concrete. Masonry, manufacturing and testing. Manufacturing, properties, and testing of steel. Metals materials manufacturing and classification.

Course Outcomes:

After completing the course, the student should be able to: -

1. List various ingredients of concrete.
2. State various properties of ingredients used in manufacturing concrete.
3. Define the various terms involved in Concrete Technology.
4. Identify the qualities of ingredients for producing concrete.
5. Explain the procedures for determining various properties of ingredients of concrete & also the properties of concrete (fresh & hardened).
6. Design the concrete mix using standard procedure given in IS Code.
7. Prepare the concrete specimens for performing various tests.
8. Conduct Non Destructing Tests using NDT tools/equipments.
9. Specify standards for different properties of ingredients of concrete as well as concrete material.

Laboratory work

1 **Tests on cement** – setting time, soundness and comp strength
2 **Testing of fine aggregate** – sieve analysis, bulking of fine aggregates and specific gravity
3 **Tests on coarse aggregate** – sieve analysis, Specific gravity, flakiness and elongation index
4 **Concrete Mix design:** IScodemethodasper10262-2009&456-2000
5 **Tests on Concrete-**
  a. Workability tests – slump and flow tests
  b. Tests on Hardened concrete – comp strength test
6 **Casting of building elements of concrete using formwork** – elements such as columns, beams, lintels etc (any one)
7 **Non-destructive Testing of concrete-** Rebound Hammer test, Ultrasonic Pulse Velocity

test.

References:

1 M.S. Shetty , "Concrete Technology",S. Chand & Company Ltd, New Delhi), 2008.
2 M.L. Gambhir "Concrete Technology",Tata Mc Graw-Hill Publishing Company Ltd. New Delhi, 2005.
3 A.M. Neville,"Concrete Technology", Pearson Education, New Delhi.
4 Orchard ,"Concrete Technology",Asia publication, New Delhi.
5 A.R. Santhakumar,"Concrete Technology",Oxford University Press Publication, India, 2009.
6 N. Krishna Raju, "Design of concrete Mixes", CBS Publishers & Distributors, New Delhi, 2006.
7 S. P. Shah, and S. H. Ahmad, "High Performance Concrete: Properties and Applications", Mc-Graw-Hill Inc. Pub., New York, 1994.
8 Aitcin, P.C., E & FN Spon ,"High Performance Concrete: Properties and Applications", London, 1998
9 M.A. Caldarone, "High Strength Concrete A Practical Guide", Taylor and Francis Publication, London, 2009.
10 "Indian standard code of practice for plain and reinforced concrete", IS 456: 2000. Bureau of Indian Standards, New Delhi.
11 "Indian Standard Concrete Mix Proportioning – Guidelines", IS 10262-2009, Bureau of Indian Standards, New Delhi.
12 "Indian Standard Methods of Sampling and Analysis of Concrete", IS 1199-1959, Bureau of Indian Standards, New Delhi.
13 "Indian Standard Methods of Tests for Strength of Concrete". IS: 516–1959. Bureau of Indian Standards, New Delhi.
14 "Indian Standard Recommended Guidelines of Concrete Mix Design", IS: 10262-1982, Bureau of Indian Standards, New Delhi
15 "Indian Standard Specification for Coarse and fine aggregates from natural sources for concrete", IS 383-1970, Bureau of Indian Standards, New Delhi.

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3181: Mini project

Teaching Scheme					Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
--	--	2	1	ISE	--	--	--	100	50

Course Description
Project report on topic in research field as recommended by supervisor and approved by DPC.

Course Outcomes:
After completing the course, the student should be able to: -
1. Collaborate with team members of division and perspective background.
2. Convert an open ended problem statement into a statement of work.
3. Decompose problem/task into sub task and establishes a timetable by which progress may be evaluated.
4. Perform feasibility analysis and uses results to choose candidate solution and evaluates quality of solutions to select best

The topic for the Mini projects may be related to Civil Engineering area and interdisciplinary area related to Civil Engineering such as–
1. Structural Engineering
2. Concrete Technology
3. Environmental Engineering
4. Geotechnical Engineering
5. Transportation Engineering
6. Infrastructural Engineering
7. Water Resources Engineering
8. Town & Country Planning
9. Construction Engineering
10. Surveying & Remote Sensing Techniques
11. Project Management
12. Legal Aspects in Civil Engineering
13. Earthquake Engineering
14. Disaster Management

Student should select the topic conforming to above. Student should work as analysis work/design/ Software Study. Student should prepare model of their work. Evaluation of Mini projects report will be done by the Departmental Committee at the end of semester VI. The Departmental Committee consist of three members.

T. Y. B. Tech. Civil Engineering – Sem.- VI
CE 3201: Industry internship

Teaching Scheme	Evaluation Scheme		
Practical : --	Practical		
	Exam.	Max. %	Min. %
Credits: 1	ISE	100	50

Course Description

The students are required to undergo rigorous field training in Civil Engineering for 21 days. Field training work will be commenced at the end of semester V. Student shall contact to supervisor and site for field training to be given by supervisor. Students shall submit the report of the field training taken and necessary certificate from the organization where such training is undertaken in semester VI.

Course Learning Outcomes:

After completing the course, the student should be able to: -

1. Make aware the responsibility of student on work site.
2. Seek knowledge , information and details at site from live situations at field.
3. Co relate practical and theoretical information and understand the concept of experienced learning.

The students are required to undergo rigorous field training in Civil Engineering for 21 days. Field training work will be commenced at the end of semester V. Student shall contact to supervisor and site for field training to be given by supervisor. Students shall submit the report of the field training taken and necessary certificate from the organization where such training is undertaken in semester VI.

The Site Work shall consist of:
1. Survey and Layout
2. Actual Site measurement
3. Quality control on site
4. Evaluation of Specification for Building materials.

The report shall consist of:
1. Site details.
2. Site layout
3. Bar chart of work done
4. Daily material consumption and Work progress report

Evaluation of field work report will be done by the Departmental Committee. The Departmental Committee consist of three members.

Rajarambapu Institute of Technology, Sakharale

(An Autonomous Institute Affiliated to Shivaji University, Kolhapur)

Third Year Engineering UG Programme

Course Code: SH3221

Course Title: Aptitude Training-II

Teaching Scheme:

L	T	P	C
1	0	2	2

Evaluation Scheme: ISE- 50% ESE- 50% (Minimum Passing Marks: 40%) Audit course

Details of the Content		
SECTION	**DETAILS**	**Hrs.**
1. GEOMETRY	• Geometry • Mensuration •	06
2. COMBINOTORICS	• P & C • Probability	10
3. SEATING ARRANGEMENTS	• Linear • Circular • Complex	06
4. SYLLOGISMS		04
5. IMAGE COMPLETION		04
6. DIRECTION SENCE		02
7. CODING DECODING/SERIES		04
8. ANALOGY		12
9. CLOCK & CALENDER		02
10. BLOOAD RELATIONS		05
	Total Hrs.	**45**

Reference Books:

1. R. S. Aggarwal, "Quantitative Aptitude", S Chand Publishing, New Delhi

2. R. S. Aggarwal, "Logical Reasoning", S Chand Publishing, New Delhi

3. Arun Sharma, "Quantitative Aptitude", McGraw Hill Publishing, New Delhi 7th Edition

4. Arun Sharma, "Logical Reasoning", McGraw Hill Publishing, New Delhi 3rd Edition

Course Learning Outcomes:

After successful completion of the course student will be able to solve aptitude problems within stipulated time with appropriate logic.

Evaluation Method:

Four tests (preferably online) will be conducted as a part of ISE.
ESE will be of 50 marks covering the entire syllabus.

Final Year B. Tech. Civil Engineering – Sem. VII

Course Code	Course	L	T	P	Cr	Scheme	Theory (Marks %) Max.	Theory (Marks %) Min. for passing	Practical (Marks %) Max.	Practical (Marks %) Min. for passing
CE4012	Design of Reinforced Concrete Elements	4	-	-	4	ISE	20		-	-
						UT1	15	40		
						UT2	15			
						ESE	50	40		
CE4041	Infrastructure Engineering II	3	-	-	3	ISE	20		-	-
						UT1	15	40		
						UT2	15			
						ESE	50	40		
CE4031	Irrigation and Hydraulic Structures	3	-	-	3	ISE	20		-	-
						UT1	15	40		
						UT2	15			
						ESE	50	40		
CE4051	Earthquake Engineering	2	1	-	3	ISE	20		-	-
						UT1	15	40		
						UT2	15			
						ESE	50	40		
CE4071	Construction Methods and Equipment	3	-	-	3	ISE	20		-	-
						UT1	15	40		
						UT2	15			
						ESE	50	40		
CE4091	Estimating and Costing Lab	--	-	2	1	ISE	-	-	50	50
CE4111	CCVL Lab	--	-	2	1	ISE	-	-	50	50
						ESE	-	-	50	50
4061	Design of Concrete Structures Lab	--	-	4	2	ISE	-	-	50	50
						ESE	-	-	50	50
CE4232	Employment Enhancement Skills (Software)*	--	--	4	2	ISE	-	-	50	50
						ESE	-	-	50	50
CE4252 RE0407 ED4001 IIPCE4003	Project Phase I Research UROP Phase I EDP & Start up Phase I **//One Online course for IIP	--	-	2	1	ISE	-	-	100	50
CE4272	Site Experience	--	-	SL	2	ISE	-	-	50	50
CE4292	Online Certification Course (QEEE/NPTEL/ AICTE)			SL	3	ISE	-	-	50	50
	TOTAL	15	1	14	28					

Total Contact Hours/week : 30
Total Credits : 28

self study or online MooC learning

**// Students who opted Industry Internship and Project (IIP) should complete one online course with ISE assessment.

* Student have to prepare/ learn any one software from given list, under Employment Enhancement Skills within institute

Note: Kindly add the relevant software's in laboratory courses available in the Departmental Computer lab.

Sr. No.	Software List	
1	ANSYS	
	SAP 2000	
	STAAD PRO	
	ETABS	
2	Primavera	
	MS Project	
	OPTICON	
3	GIS	
	TERRA MODEL	
4	AUTOSTEEL AUTOSCAN	
	AUTODESK ARCHITECTURAL DESKTOP	
	HIT OFFICE	
	QE Pro	

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4012 Design of Reinforced Concrete Elements

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
4	-	--	4	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

Design of Reinforced Concrete Elements is offered at the seventh semester of Civil Engineering undergraduate programme. Since last five decades concrete has emerged as a versatile construction material and hence is being used for constructing almost all types of civil engineering structures. Consequently every civil engineer must have sufficient knowledge of concrete and Reinforced Concrete elements and structures. Without good knowledge of design of concrete structures a civil engineer will be incomplete.

This course deals with design of various structural elements such as R.C. beams, slabs, stairs, columns & footings using modern Limit State Method. Design of these elements is made using guidelines of I.S. 456:2000, a code of practice for plain & reinforced cement concrete.

Course Outcomes:

After successfully completing the course, Student will able to:
1. Analyze and design singly, doubly reinforced and flanged beams.
2. Analyze and design R.C.C. slab and R.C.C. staircase.
3. Analyze and design R.C.C. columns, isolated pad footing and combined footing.

Prerequisites:

The prerequisite for this course is knowledge of analysis of structures (structural mechanics) and mathematics. Student should have clear understanding of various structural elements, their arrangement and transfer of loading & nature of stresses induced in the elements. This course intends to build the competency in the students to design the various structural elements and to design small structures.

Unit Wise Syllabus:

Unit 1: Design Process and Loads   6 hrs

Design process, Structural Design and load path, Methods of analysis and design, Working stress method, Limit state method. Limit State Method: Limit State of Collapse, Serviceability, Durability, Characteristic Strength and Load, Partial Safety Factors. Properties of Material: Concrete and Steel – MS, HYSD and Latest development in Steel bars. Introduction to IS 875 and IS 456 latest publications.

Unit 2: Singly and Doubly Reinforced Section (Limit State of Serviceability)   8 hrs

Stress block parameters, modes of failure, properties of singly and doubly reinforced rectangular section, Problems in singly and doubly reinforced section.

Unit 3: Design of Flanged Sections, Continuous beams and Slabs (Limit State of   10hrs
Serviceability)

Design of one way, two way, continuous slabs. Properties of flanged sections, Problems in flanged sections.

Limit state design of two span continuous beam and three span continuous beam using IS code coefficients. Concept of moment redistribution applied to propped cantilever. Coefficients.

Unit 4: Shear, Bond and Torsion (Limit State Method)   8hrs

Shear in beams, Cracks, Modes of failure, Critical sections for shear, Design for Shear reinforcement. Types of bonds, curtailment in bars, Detailing of reinforcement.

Torsion: Limit state of collapse, behavior of RC rectangular sections subjected to torsion. Design of sections subjected to torsion, bending and shear.

Unit 5: Design of Stair cases and Columns (Limit State Method)   8hrs

Design of Dog-legged and Open well staircases, Effective span and loads distribution, Design of short columns, slenderness limit and eccentricity, interaction diagrams, column with helical reinforcement.

Unit 6: Design of Footing (Limit State Method)   8 hrs

Design of isolated pad footings, combined footing.

References

1. Shah V. L. and Karve S. R. Illustrated Reinforced Concrete Design, Structures Publications, Pune.
2. Syal I. C. and Goel A. K, Reinforced Concrete Structure, S. Chand and Company Ltd., New Delhi.
3. Gambhir M. L, Design of Reinforced Concrete Structures, PHI Learning Pvt. Ltd.
4. Punmia B C, Ashok Kumar Jain, Arun Kumar Jain, Limit State Design of Reinforced Concrete, Laxmi Publications Ltd., New Delhi.

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4041 Infrastructure Engineering II

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Discription:

The Infrastructure Engineering-I will equip students to meet maintain ageing infrastructure, integrate new infrastructure into existing systems, and expand existing infrastructure important challenges. The program was developed in response to the growing need for engineers with advanced knowledge of the characteristics and significance of infrastructure, including its technological, economic and social impact.

Course Outcomes:

After successfully completing the course, Student will able to:
1. Design rail transportation system
2. Analyze need of modern rail system
3. Perform site investigation for bridge
4. Apply standards to railway bridge system.

Unit Wise Syllabus:

Unit 1: Railway Transport   6 Hrs

Transport Planning - Rail transport – surveying - permanent way - rail gauge – sleepers – ballast - rolling stocks

Unit 2: Railway design and maintenance   6 Hrs

Geometric design-track design-plate laying - track maintenance-station yards & equipment - Points & crossing – Signaling - Interlocking - Tracking power & resistance - Safety.

Case study-I

Unit 3: Modern Railway   6 Hrs

Urban railway - metro railway - mono rail - semi speed & high speed train - magnetically elevated train - Cargo train - wagon type & development - Current situation in India

Case study –II

104

Unit 4: Bridge Engineering   6 Hrs
Definition-basic forms − components − classification - historical development-
components of bridge − importance of bridge − conceptual design & types of
construction bridge. Case study - III

Unit 5: Bridge Investigation   6 Hrs
Need − selection of bridge site − determination of design discharge − economical
span − location of piers & abutments − Bearing − joints & appurtenances −
vertical clearance above HFL − soil exploration − scour depth − traffic volume,
density & projection study − investigation
Case study -IV

Unit 6: Standard specification for Roadway & Railway Bridge   6 Hrs
A. Road way − IRC specification − width of carriage way − clearance − design
   of load − dead load − live load − earthquake load − forces on bridge −
   buoyancy effect − temperature and differential pressure effect
B. Railway − Erection method - clearance − design of load − dead load − live
   load − earthquake load − forces on bridge − earth pressure on abutment.
Case study −V

References :
1   Khanna S.K. and C.E.G. Justo "Highway Engineering", Nem Chand & Bros.,
    Roorkee(2000).
2   Khanna S.K., Arora M.G. and Jain S.S. " Airport Planning and Design", Nem Chand and
    Bros., Roorkee(1997).
3   Partha Chakroborty and Animesh Das "Principles of Transportation Engineering", Prentice-
    Hall India, New Delhi(2003).
4   Oza, "Dock and Harbor Engineering", Chartor pub. house
5   Shrinivasan, "Dock, Harbor and Tunnel Engineering",Chartor pub. house
6   Drew D.R. "Traffic Flow Theory and Control", McGraw-Hill, New York(1968).
7   Hutchinson B.G. "Principles of Urban Transport Systems Planning" McGraw-Hill Book Co,
    New York(1974).
8   McShane W.R. and Roess R.P. "Traffic Engineering", Prentice-Hall Inc., New
    Jersey(1990).
9   Horonjeff Robert: "The Planning and Design of Airports", McGraw Hill Co., New York.
10 IRC: 76-1979 − Tentative Guidelines for Structural Strength Evaluation of Rigid Airfield
    Pavement, IRC, New Delhi.
11 IRC: 85-1983 − Code of Practice for Accelerated Strength Testing and Evaluation of
    Concrete Road and Air field Constructions, IRC, New Delhi.
12 IRC: 58-2002 (Second Revision) − Guidelines for the Design of Rigid Pavements for
    Highways, IRC, New Delhi.
13 IRC: 37-2001 − Guidelines for the Design of Flexible Pavements for Highways, IRC, New
    Delhi.

14 Yang H. Huang "Pavement Analysis and Design", Prentice-Hall (1993).

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4031: Irrigation and Hydraulic Structures

Teaching Scheme			Evaluation Scheme					
L	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
				Max	Min for Passing		Max	Min for Passing
3	--	3	ISE	20			--	--
			UT 1	15	40	40	--	--
			UT 2	15				
			ESE	50	40		--	--

Course Description

Irrigation and Hydraulic Structures is a important subject offered in the 7th semester of civil engineering course. The subject deals with two different modules of civil engineering. The first module is dealing with Dams, reservoirs, spillways, their planning and design concept. Study of various openings through dam. The second module deals with irrigation water distribution using various canals, their design. It also gives idea about river training works. This study gives an idea of irrigation in field, government strategies. These two modules give practical orientation of subject towards actual field. Course is supported by site visit. This leads the student to know very much useful idea and correlation between theory and practical.

Course Outcomes:

After completion of the course students will be able to:
1. Analyze and design Hydraulic structures
2. Compute storage capacity of various types of reservoir and their design aspects.
3. Calculate control levels of reservoir.
4. Analyze and design gravity and earthen dam for various hydraulic conditions.
5. Draw typical plan of various hydraulic structures.

Unit Wise Syllabus :

Unit 1: Cross drainage works   6 hrs
a) **Cross drainage works**: - types of aqueducts, component, layout, design of aqueducts, super passage, CD works, design of channel transitions.
b) Modern methods of lift irrigation based on canal system

Unit 2: Canal Irrigation   6 hrs
Lacey's theory, Kennedy's theory, balancing, design and design problem, canal distributaries, construction and maintenance of canal

Unit 3: Weirs and Spillways   6 hrs
Weirs: Different types of weirs, different types of diversion weirs – Component parts of diversion head works. Causes of failures of diversions, weirs – Weirs on permeable foundation with design principles. Bligh's Creep theory, Khosla's Theory,

Spillways: types, spillway gates, energy dissipation, River Training, Guide banks, Groynes and spurs

Unit 4: Reservoir and Dams   6 hrs
a) **Reservoir** :- Types, Planning, control levels, yield calculation, Reservoir site selection, Storage zones, Reservoir storage capacity, Mass Inflow curve and Demand curve, surveys for reservoir planning
b)**Dams** :- Selection of site for dams, Classification of dams, Factors governing selection of type of dam, Forces acting on dam

Unit 5: Earthen Dam   6 hrs
Earthen Dam: Types, causes of failure, design criteria for Earth Dam, seepage, filter and drainage, stability & design calculations.

Unit 6: Gravity Dam   6 hrs
Gravity Dam: forces, modes of failure, design, stability & design calculations.

References:
1. Garg S.K., "Irrigation Engineering", khanna publishers, Delhi 2nd edition, 1991
2. Dr. Punmia B.C., "Irrigation Engineering", Laxmi publishers, Delhi 1990.
3. Sing Bharat, "Irrigation Engineering", Earthscan Publishers, USA
4. "Irrigation Modules by Irrigation Department", Maharashtra, MERI Nashik, 2007
5. Birdi & Das – "Irrigation Engineering", New Delhi 1998
6. Ghanshyam Das – "Hydrology & soil conservation Engineering", New Delhi

Final Year B. Tech. Civil Engineering – Sem. VII
CE4051 Earthquake Resisting Structures

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
2	1	--	3	ISE	20		40	--	--
				UT 1	15			--	--
				UT 2	15	40			
				ESE	50	40		--	--

Course Description:

This course integrates information from various engineering and scientific disciplines in order to provide a rational framework for the design of earthquake-resistant structures. As such, the course touches upon pertinent information from engineering seismology, geotechnical engineering, economic, risk and reliability theory, sustainable development, and architecture in addition to advanced topics related to structural dynamics, analysis and design. The focus of the course is on building structures, but general issues are covered related design of bridges, industrial facilities and other types of structures that are allowed to respond in the inelastic range in the event of a major earthquake. The course emphasizes understanding the fundamental factors that influence and control the response of such structures, establishing a performance-based framework with which to assess seismic response, selecting project appropriate structural systems, configurations and proportions, and developing effective, but simplified, design procedures capable of reliably achieving specified performance goals.

Course Outcomes:

After successfully completing the course, Student will able to:
1. Evaluate dynamic response for SDOF system for different loads.
2. Calculate lateral loads developed due to earthquake force by linear methods.
3. Examine different methods available for reducing effects of dynamic loads.

Unit Wise Syllabus:

Unit 1: Elements of Seismology   06 Hrs

Terminology used in earthquake engineering, structure of earth, phenomenon of earthquake, Earthquake causes, Plate tectonic theory, elastic rebound theory, magnitude and intensity of earthquake, relation between magnitude and energy released during earthquake. Earthquake waves, Analysis of earthquake data, seismic zoning, causes of earthquake damage, history of past earthquakes, earthquake

prediction.

Unit 2: Fundamentals of Theory of Vibration   06 Hrs

Introduction to structural dynamics, definition of basic problem in dynamics, static versus dynamic loads, different types of dynamic loads. Types and causes of vibrations, Free and forced vibration of single degree, Dhuhamel's Integral, response spectra, support motion, Transmissibility, tripartite response spectrum, design response spectrum.

Unit 3: Concept of Seismic Design   06 Hrs

Importance of Earthquake Resistant Design, Seismic Forces, Characteristics of earthquake, Application of response spectrum theory in seismic design, Evaluation of seismic force as per Indian code, lateral load analysis of building as per IS 1893-2002.

Unit 4: New Techniques in Seismic Design   06 Hrs

Codal Provisions for Ductile Detailing of RC Structures subjected to Seismic as per IS 13920, Codal Provisions for load bearing structures as per IS 4326. Base Isolation technique, Seismic dampers, Field visit, and demonstration of behavior of structures under horizontal and vertical motion.

Tutorials:

One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, open book test, surprise test, declared test, seminar, final orals and any others. The teacher may add any of other academic activity to evaluate student for his/her in semester performance. Problems on above units II & III, study of behavior of different structures under dynamic loading.

References :

1. Dowrick D. J., "Earthquake Resistant Designs", John Wiley and Sons Agarwal Pankaj and Shrikhande Manish, Earthquake Resistant Design of Structures, Prentice Hall of India, New Delhi, 2006
2. IS:1893 (2002), "Indian Standard Criteria For Earthquake Resistance of Structures", (Part I): General Provisions and Building (Fifth Revision), Bureau of Indian Standards, New Delhi
3. IS:4326 (1993), "Criteria for Earthquake Resistant Design and Construction of Buildings – Code of Practice", Bureau of Indian Standards, New Delhi.
4. IS: 13920, (1993), "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Force – Code of Practice", Bureau of Indian Standards, New Delhi.
5. IS 456 (2000), "Plain and Reinforced Concrete - Code of Practice", Bureau of Indian Standards, New Delhi.
6. S. K. Duggal – "Earthquake Resistance Design of Structures", Oxford University Press.
7. Mario Paz, " Structural Dynamics", CBS publication.

8. Jai Krishna, "Elements of earthquake Engineering", South Asia Publication, Delhi.

Final Year B. Tech. Civil Engineering – Sem. VII
CE4071 Construction Methods and Equipment's

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	-	--	3	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15				
				ESE	50	40		--	--

Course description:
"Machines make it possible" this statement is 100% true as today's construction industry is 90% dependent on equipments right from manufacturing to installation or building. It is of prime importance to a civil engineer to understand the operations and feasibility of construction equipments for particular task. This course will deliver operations, cycle time computation and approximate production for equipment selection.

Course Outcomes:
After the completion of course students will be able to
1. Plan equipment utilization for earthwork operation,
2. Perform economic analysis of equipments,
3. Select earthwork equipment based on production and site requirements,
4. Decide plant capacity required for a project,
5. Justify the construction method selected for particular task.

Unit Wise Syllabus:

Unit: 1   Equipment economics   **6 Hrs**
Selection of equipments, equipment economics, site access, construction services. Manual Vs Mechanical construction. Planning for construction.

Unit: 2   Earth work Equipments   **6 Hrs**
Process of earthwork, equipments for earthwork, cycle time of earth work equipment, Production of Earthwork equipments.

Unit: 3   Hard rock excavation   **6 Hrs**
Ripping, definition, process. Drilling equipments, splitting equipments, Excavation by Blasting, Blasting materials.

Unit: 4   Construction Plants   6 Hrs

Brief introduction and layout of construction plants viz: RMC, HMA, Crushers. Plant production.

Unit: 5   Pilling, Dewatering and Ground water control   6 Hrs

Introduction to piling, Pile classification, Pile installation methods. Introduction to dewatering, Methods of dewatering, Installation of dewatering and ground water control systems.

Unit: 6   Formwork   6 Hrs

Formwork: Requirement of good formwork, objectives of formwork. Types of formwork: Conventional formwork, Slip formwork, Aluminium formwork; applications, erection, safety. Formwork design parameters, Formwork failure.

References

1. R. L.Purifoy, Construction planning equipment and methods, 7th edition, McGraw Hill Book, 2006
2. Frank W. Stubbs, Handbook of Heavy Construction, , McGraw-Hill Professional Publishing; 1971
3. James J. O'Brien, Standard handbook of heavy construction, , McGraw-Hill Professional Publishing; 1996
4. Douglas D. Gransberg, Calin M. Popescu and Richard C. Ryan, Construction Equipment Management for Engineers, Estimators and owners, , CRC Press, Taylor and Francis group, 2006.

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4091: Estimating and Costing lab

Teaching Scheme				Evaluation Scheme				
L	T	P	Cr	Scheme	Theory (Marks %)		Practical	(Marks %)
					Max	Min. for passing	Max	Min. for passing
-	-	2	1	ISE	-	-	50	50
				ESE	-	-	50	50

Course Description:

Principles of construction cost estimating of the related materials, labor, and machines. The techniques of calculations to be applied to the wide variety of construction projects, housing, and commercials.

Course Outcomes:

After completion of this course student should be able to:-
1. Prepare estimate for public buildings.
2. Discuss specifications for various items of public buildings.
3. Analyse rates for various item of public buildings.

Practicals:

Practical No. 01:- Estimating and Costing of Public Building(Any one of the following Shopping Mall, School Building, Institutional Building)

Practical No. 02:- Estimating and Costing of Public Building

Practical No. 03:- Estimating and Costing of Public Building

Practical No. 04:- Estimating and Costing of Public Building

Practical No. 05:- Estimating and Costing of Architectural items (Landscaping, Façade,)

Practical No. 06:- Estimating and Costing of Architectural items (Landscaping, Façade,)

Practical No. 07:- Estimating and Costing of Architectural items (Landscaping, Façade,)

Practical No. 08:- Rate analysis for special items like (Façade, Landscaping)

Practical No. 09:- Rate analysis for special items like (Façade, Landscaping)

Practical No. 10:- Specifications of Lift, Elevator, Air Conditioning

Practical No. 11:- Specifications of Lift, Elevator, Air Conditioning

Practical No. 12:- Specifications of Lift, Elevator, Air Conditioning

References:
1   P.L.Bhasin, "Quantity Surveying", S.Chand&Co-Ramnagar, Delhi-110055.
2   S.C.Rangwala, "Elements of Estimating and Costing", Charotar.
    Publishing house- Opp Amul Dairy Court road Anand.388001(westrly) India.
3   B.S.Patil, "Civil Engineering Contracts and Estimates", Universities Press Private Ltd. 3-5
    819 Hyderguda, Hyderabad.500029,(A.P),India.
4   B. N. Dutta, "Estimating and Costing", Dhanpat Rai & Sons.1682,Nai Sarak, Delhi
    110006.
5   Birdi, "Estimating and Costing", Dhanpat Rai & Sons1682,Nai Sarak,Delhi-110006.
6   Chakroborty M., "Estimating,   Costing   and   Specification in   civil
    engineering',21b,Bhabananda Road,Kolkata-700026.
7   S.C. Rangwala, "Valuation of real Properties", Charotar Publishing House-opposite Amu
    dairy, court Road Anand.388001. India.
8   "Standard specifications Volumes I & II', (P.W.D. Maharashtra), Govt. of Maharashtra.

9   C.P.W.D. specifications.
10 C.P.W.D. schedule of rates.

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4111: Construction Contracts and Valuation Lab

Teaching Scheme				Evaluation Scheme				
					Theory (Marks %)		Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing
-	-	2	1	ISE	-	-	50	50
				ESE	-	-	50	50

Course Description:
This course is descriptive, the course in construction contract administration is designed primarily for students in quantity surveying and allied disciplines. The focus is to impart useful skills on the students in order to enhance their theory of quantity surveying and prepare them for contract administration after graduating from the program.

Course Learning Outcomes:
After successfully completing the course, Student will able to:
1. Apply rights and responsibilities of parties of contracts.
2. Prepare contract document.
3. Explain different types of values and methods of valuation.
4. Prepare valuation report for the open land and different buildings.

Laboratory work:
1 Conducting role play for tendering process :
   i. Advertisement of tender notice,
   ii. Filling tender form,
   iii. Opening of tender form,
   iv. Selection of tender,
   v. Rejection of tender,
   vi. Issue of work order
   vii. Introduction of E-tendering.
2 Preparation of contract document
3 Preparation of valuation report for the following
   i. Residential Building
   ii. Cinema Theatre
   iii. Commercial shop
   iv. Hotel Building
   v. Building given on rent
   vi. Open land for development

References:

1 B. S. Patil , "Civil Engineering Contracts and Estimates" , Universities Press Private Ltd. 3-5-819, Hyderguda, Hyderabad.500029(A.P),India.

2 S. C. Rangwala , "Valuation of real Properties", Charotar Publishing, House- opposite Amul dairy, court Road Anand. 388001.India

3 Roshan, Nanavati, "Professional Practice (Estimating and Valuation)", U.B.S. Publishers, Distributers PVT.Ltd.5 Ansari road New Delhi, 1984.

4 Dutta, "Estimating and Costing", Dhanpat Rai & Sons. 1682, Nai Sarak, Delhi-110006.

115

Final Year B. Tech. Civil Engineering – Sem. VIII
CE 4061 Design of Concrete Structures Lab (Mini Project)

Teaching Scheme				Evaluation Scheme				
L	T	P	Cr	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for passing	Max	Min for passing
-	-	4	2	ISE	-	-	50	50
				ESE	-	-	50	50

Course Description:

Design of Reinforced Concrete Elements is offered at the seventh semester of Civil Engineering undergraduate programme. Since last five decades concrete has emerged as a versatile construction material and hence is being used for constructing almost all types of civil engineering structures. Consequently every civil engineer must have sufficient knowledge of concrete and Reinforced Concrete elements and structures. Without good knowledge of design of concrete structures a civil engineer will be incomplete.

This course deals with design of various structural elements such as R.C. beams, slabs, stairs, columns & footings using modern Limit State Method. Design of these elements is made using guidelines of I.S. 456:2000, a code of practice for plain & reinforced cement concrete.

Course Outcomes:

After the completion of this course students will be able to:
1. Estimate primary and combination design loads on building consulting appropriate standards and handbooks
2. Design the component parts of the building manually
3. Model the same building using any standard software
4. Design the building.
5. Demonstrate effective team membership/leadership through a group project

Laboratory Work

Analysis and design of RCC framed building- manually and using any standard software, sketching the detailing of the reinforcement.

References

1. Sinha and Roy - Fundamentals of Reinforced Concrete-, 3rd Edition, S. Chand and Company Ltd, New Delhi
2. A. K. Jain - Reinforced Concrete Design
3. Karve and Shah - Limit State Theory and Design-, Structures Publications, Pune
4. P. C. Varghese - Limit State Design of Reinforced Concrete, 2nd Edition, Prentice Hall of

116

India, New Delhi

5. IS: 456-2000

6. IS: 1343- 1987

7. T. Y. Lin - Prestressed Concrete, John Willey & Sons, Newyork

8 Sinha and Roy - Prestressed Concrete , S. Chand and Company, New Delhi

9. N.Rajgopalan - Prestressed Concrete, 2nd Edition, Narosa Publishing House, Mumbai

10. N. Krishna Raju - Prestressed Concrete

11. N. Unnikrishna Pillai/ Devdas Menon - Reinforced Concrete Design, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi

CE 4232 Employment Enhancement Skills

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
--	--	4	2	ISE	--	--	100	50
				ESE	--	--	100	50

Course Learning Outcomes:

1. Develop technical competence in a Soft skill in the Civil Engineering field,

2. Apply the techniques and soft skills for Civil Engineering practice.

3. Develop oral and written presentation skills for soft skill project.

4. Design and interpret data by soft skill Civil Engineering projects.

This lab course is offered in Semester VII of Final Year B.Tech. Student is required to make presentation on the progress of his/her soft skill undertaken work in front of supervisor during the semester. Final presentation only if he has submitted duly completed and certified report by supervisor in front of supervisor and DPC member. Examiners will check whether the work is in full compliance. Soft skill work will be assesed on the basis of quality of work, effort taken by the student, knowledge and skill aquired etc.

Student should carry out application oriented project work in a batch for any one software from the following list.

Certificate is optional/ ESE evaluation is done by External member
1. ANSYS
2. SAP 2000
3. STAAD PRO
4. ETABS
5. Primavera
6. MS Project
7. OPTICON
8. GIS
9. TERRA MODEL
10. AUTOSTEEL AUTOSCAN
11. AUTODESK ARCHITECTURAL DESKTOP
12. HIT OFFICE
13. QE Pro

CE 4272: Site Experience

Teaching Scheme	Evaluation scheme		
Site Work: 4 Hrs/Week (Self Learning)	Site Work		
	Exam	Max %	Min %
Credits:2	ISE	100	50

The students are required to undergo rigorous site experience in Civil Engineering for whole VII semester. Site experience will be commenced at the start of semester VII. Student can choose any locally available site. Students shall submit the report of the site experience taken and necessary certificate from the organization where site experience is undertaken in semester VII.

Course Learning Outcomes:

After successfully completing the course, Student will able to:

- Develop most efficient method to handle construction activities on site.
- Criticize the technical and social issues on site
- Prepare and present technical report

Expectations:

1. Students must spent 4 hrs on site within one week on consecutive working days of the week. (Preferably on Saturday/ On any working days)
2. Students can choose any local site (Residential/ Commercial/ Industrial) according to convenience and ease in access.
3. Students should maintain regular activity file throughout the semester.
4. Students must understand which are the methods used for management of all construction activities on site.
5. Students must learn the structural design aspects in detail. (Steel checking, Reinforcement cutting and fitting, use and implementation of bar bending and reinforcement schedule)
6. Selected Site must be at its initial stage so that student can understand all the sequential activities right from excavation to finishing of building etc.
7. Complete report of work done should be submitted to the coordinator at the end of site experience.

The report shall consist of:
1. Detailed weekly progress report
2. Material consumption report
3. Structural drawings and design
4. Weekly notes of work done on site

ISE Evaluation of site experience work will be done on Weekly progressive report file submission and final presentation.

CE 4792 Online Certification Course

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory (Marks %)		Practical (Marks %)	
					Max	Min for Passing	Max	Min for Passing
SL	--	--	3	ISE	100	50	--	--

Course Learning Outcomes:

1. Develop technical competence in a skills of Civil Engineering field,

2. Apply the techniques for Civil Engineering practice.

3. Develop oral and written presentation skills for Civil Engineering project.

4. Design and interpret data for Civil Engineering projects.

Online Certification course for 3 credits

1. Student should select and complete any one online course floated by NPTEL. (4/8/12 Weeks).
2. Student should report and maintain file of weekly submission as per the assignments given by NPTEL.
3. The student should attach weekly grade sheet in the hard copy form to weekly submission file. (On every Saturday 10.10am to 12.10pm)
4. Final written exam is compulsory to all and it will be scheduled by NPTEL.
5. Submit the final grade sheet with course completion certificate.
6. The final grading will be given based on grades offered by NPTEL and file submission.

Online Certification course for 1 credit

The students opting for Industry Internship and Project (15 students) for 1 credit should complete one online course offered by QEEE courses. The list of courses is attached herewith.

1. Student should select and complete any online course floated by QEEE.
2. Student should report and maintain file of weekly submission as per the assignments given by QEEE. (On every Saturday 10.10am to 12.10pm)
3. Submit the hard copy of assignments with course completion certificate.
4. The final grading will be given based on assignments and file submission.

Academic Year 2017-2018 (Semester VII)
Online Certification Course for 3 Credits

NPTEL Courses

Sr. No.	Course name	Duration	Faculty	Registration Date
1	Digital Image processing of Remote Sensing Data	4 Weeks	Prof. Arun K Saraf, IITR	JULY-AUG 2017
2	Geotechnical engineering laboratory	4 Weeks	Prof. J. N. Mandal IITB	JULY-AUG 2017
3	Reinforced Concrete Road Bridges	4 Weeks	Prof. Nirjhar Dhang IITKGP	JULY-AUG 2017
4	Project planning and control	8 Weeks	Prof. Koshy Varghese, IITM	JULY-SEP 2017
5	Principles of Construction Management	8 Weeks	Prof. Sudhir Misra IITK	AUG-OCT 2017
6	Foundation Design	12 Weeks	Prof. N.R. Patra IITK	JULY-OCT 2017
7	Integrated Waste Management for a Smart City	12 Weeks	Prof. Brajesh Kumar Dubey IITKGP	JULY-OCT 2017
8	Computational hydraulics	12 Weeks	Prof. Anirban Dhar IITKGP	JULY-OCT 2017
9	Design of steel structures	12 Weeks	Prof. Damodar Maiti IITKGP	JULY-OCT 2017
10	Strength of materials	12 Weeks	Prof. Sriman Kumar Bhattacharya IITKGP	JULY-OCT 2017
11	Design of reinforced concrete structures	12 Weeks	Prof. Nirjhar Dhang IITKGP	JULY-OCT 2017
12	Structural analysis I	12 Weeks	Prof. Amit Shaw IITKGP	JULY-OCT 2017
13	Geoenvironmental Engineering (Environmental Geotechnology): Landfills, Slurry Ponds & Contaminated Sites	12 Weeks	Prof. Manoj Datta IITD	JULY-OCT 2017

B. Tech. Semester VIII [Option - I]

Course Code	Course Title	Contact Hours			Credits	Evaluation Scheme					
		L	T	P			Theory (Marks %)			Practical (Marks %)	
						Scheme	Max	Min for passing		Max	Min for passing
CE****	Program Elective-I	3	-	-	3	ISE	20		40		
						UT1	15				
						UT2	15				
						ESE	50	40			
CE****	Program Elective-II	2	-	-	2	ISE	20		40		
						UT1	15				
						UT2	15				
						ESE	50	40			
OE****	Open Elective-I	3	-	-	3	ISE	20		40		
						UT1	15				
						UT2	15				
						ESE	50	40			
OE****	Open Elective-II	3	-	-	3	ISE	20		40		
						UT1	15				
						UT2	15				
						ESE	50	40			
CE****	Program Elective I Laboratory	-	-	2	1	ISE				50	50
						ESE				50	50
CE4122	Project				12	ISE				50	50
						ESE				50	50
					24						

- **$$ List of Program Elective Courses**

Course Code	Elective		
	Program Elective I - PE1		
CE4171	Advanced Structural Analysis		
CE4271	Advanced Engineering Geology		
CE4181	Finite Element Analysis		
CE4201	Advanced Structural Design		
CE4151	Solid and Hazardous Waste management		
CE4241	Geo-informatics for Engineering		
CE4311	Advanced Foundation Engineering		
CE4461	Industrial Waste Treatment		
	Program Elective I – PE2		
CE4211	Advanced Construction Materials		
CE4231	Project Appraisal		
CE4251	Construction Safety		
CE4361	Fundamentals of Urban Planning		
CE4381	Optimization Techniques		
CE4401	Disaster Management		
CE4421	Building Services and Maintenance		
CE4291	Green Technologies in Civil Engineering		
CE4281	Air Pollution and Control		
CE4191	Design of Flyovers and bridges		
CE4501	Probability and Statistics		

Course Code	Elective		
	PE1 - Laboratory Courses		
CE4521	Advanced Structural Analysis Lab		
CE4541	Advanced Engineering Geology Lab		
CE4561	Finite Element Analysis Lab		
CE4581	Advanced Structural Design Lab		
CE4601	Solid and Hazardous Waste management Lab		
CE4621	Industrial Waste Treatment Lab		
CE4641	Advanced Foundation Engineering Lab		
CE4661	Geo-informatics for Engineering Lab		

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4171 Advanced Structural Analysis (Program Elective-I)

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	-	--	3	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description

This course provides civil engineering students theory and application of structural analysis, with an emphasis on developing an understanding of structural behavior. The course also includes an introduction to building code provisions related to structure loading. Test evaluations are based on measurements of strains and deflections at varying load levels. Analysis consists of axial tension, stress concentrations, evaluation of a beam in flexure, evaluation of a rod in torsion, evaluation of a slender column under a compressive force, evaluation of a full scale open web steel joist and subjecting a steel beam being loaded to its plastic moment capacity.

Course Learning Outcomes:

After successfully completing the course, student will able to:
1. Construct ILD for indeterminate beams and two hinged arches.
2. Compute bending stresses in beam subjected to unsymmetrical bending
3. Analyze beams curved in plan, multistoried buildings and space frames.

Unit Wise Syllabus:

Unit 1: Influence Lines   9 hrs

Uses of ILD, Muller Breslau's principle & moment distribution method, ILD for propped cantilever, fixed beam, two & three span continuous beams, and two hinged arches

Unit 2: Beams Curved in Plan   9 hrs

Analysis of determinate and indeterminate rectangular, circular and semicircular beams curved in plan.

Unit 3: Unsymmetrical Bending and Space Frames   9 hrs

a. Unsymmetrical Bending: Location of neutral axis, bending stresses in rectangle, and angle sections

125

b. Space frames: Analysis of space trusses by tension coefficient method

Unit 4: Analysis of Building Frames   **9 hrs**

Approximate methods of analysis of multistoried frames: - Assumptions, analysis of multi bay 2-D rigid jointed frames subjected to lateral load by Portal method and Cantilever method.

References

1. Vazirani and Ratwani, "Analysis of Structures Vol.II", Khanna Publisher, Delhi.
2. Vazirani and Ratwani, "Advanced Theory of Structures & Matrix method", Khanna Publisher, Delhi.
3. Timoshenko and Gere, "Strength of Materials Vol II", East West Press Ltd.
4. Gere and Weaver, "Matrix Analysis of Framed Structures", CBS Publishing, Delhi.
5. Pandit & Gupta, "Structural Analysis - A matrix approach", Tata Mc Graw Hill, Delhi.
6. Negi and Jangid, "Structural Analysis", Tata McGraw Hill Pub.Co.Delhi.
7. Ramchandra, "Design of Steel Structures Vol II", Standard Book House, Delhi.
8. B. C. Punmia and A. K. Jain, "Design of Steel Structures", Laxmi pub ltd. delhi Book House, Delhi.
9. C.S. Reddy, "Basic structural Analysis", Tata Mc Graw Hill, Delhi.

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4271 : Advanced Engineering Geology (Program Elective I)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
3	-	--	3	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description:

This course explores the fundamentals of geology applied to civil engineering problems. Topics include rock and mineral types, soil properties, geological structures, active tectonics and earthquake hazards, slope stability and landslides, groundwater, rivers and flood hazards. The goal of the course is to increase the student's knowledge and understanding of geology, and apply this knowledge to engineering projects such as dams, landfills, rock quarries, roads and tunnels. GIS is an effective tool to analyze spatial, non-spatial data on drainage, geology, land form parameters to understand their interrelationship.

Course Learning Outcomes:
After successfully completing the course, student will able to:
1. Evaluate geological formations and site suitability for construction of major civil structures
2. Apply geophysical methods for subsurface exploration
3. Examine the geo-environmental hazards

Pre-Requisites
Earth Science, Geo-informatics and Civil Engineering

Unit Wise Syllabus:

Unit 1: Stratigraphy and Indian Geology   **9 hrs**

Geological time scale; Physiographic division of India. General study of important geological formations in India: Dharwar Craton, Granulite terrain, Eastern Ghat, Bhandara Craton, Singhbhum Craton, Rift Valley, Gondwana group, Himalayas and Deccan Traps.

Unit 2: Subsurface exploration 9 hrs

Subsurface geological investigation such as determination of thickness of overburden, depth of hard rock, groundwater potential zones and mineral exploration using geophysical techniques. Introduction, basic principle, instruments, field procedure, interpretation and application of geophysical techniques viz. magnetic, gravitational, electrical resistivity, seismic and well logging. Exploratory drilling: methods, observation, preservation and limitations.

### Unit 3: Geological studies of major civil structures 9 hrs

Site investigation, characterization and problems related to civil engineering projects: geological investigations for dams, reservoirs and spillways, tunnels and shorelines.

Unit 4: Geo-environmental hazards 9 hrs

Exploitation of water and mineral resources; Physico-chemical properties of water; Quality criteria for different uses; Graphical presentation of groundwater quality data; Groundwater quality in different provinces in India; Groundwater contamination: Arsenic, Fluoride, Lead, chromium and radioactive; Sea water intrusion; Ghyben-Herzberg equation; Earthquake; Landslide; Intra Plate seismicity; Intra plate earthquakes in Peninsular India; Earthquakes in gangetic foreland; Himalayan earthquake.

References

1. Bell F. G., "Engineering Geology", 2nd Edition Butterworth-Heinemann is an imprint of Elsevier Linacre House, Jordan Hill, Oxford OX2 8DP, UK p 581
2. Deshpande G. G., "Geology of Maharashtra, Geological Society of India", 1st Edition 1998, 223p
3. "Koyana Earthquake Journal", (1968) Indian Geophysics Uni.
4. Krishna Swamy., "India's Mineral Resources", Oxford & I.B.H.Co.
5. Krishnan M. S., "Geology of India and Burma", Higginbotham Pvt Ltd;
6. Naqvi S. Mahamood and Rogers Jhon J.W., "Precambrian Geology of India", Oxford University Press 1987. 214 p
7. Parbin Singh, "Engineering Geology".
8. Patwardhan A. M. "The Dynamic of Earth System", 2nd Edition PHI LEARNING PVT. LTD-NEW DELHI 2010.
9. Ramachandra Rao M. B., "Outline of Geophysical Prospecting A manual for geologist", Parasranga Univesrsity of Mysore. 1st Print 1975. 398 p
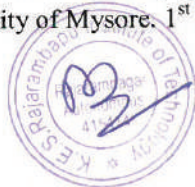
10. Reddy D. V., "Engineering Geology for Civil Engineering", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1st Edition, 1995.
11. Todd D. K., "Groundwater Hydrology", John Wiley and Son, New York.
12. Valdia K. S., "Environmental Geology", Indian Context Tata Mc Graw Hill Publishing Company Ltd. New Delhi.

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks)			Practical (Marks %)	
					Max	Min for Passing %		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

The finite element method and its applications to engineering problems: truss and frame structures, heat conduction, and linear elasticity; use of application software; overview of advanced topics such as structural dynamics, fluid flow, and nonlinear structural analysis.

Course Learning Outcomes:

After successfully completing the course, Student will able to:

1. Apply variational and direct approach method for 1D, 2D problems.
2. Develop stiffness matrix for linear spring, bars, beam and truss (1D, 2D & 3D problem).
3. Explain terminology used in FEM
4. Generate relationship between natural and cartesian coordinate system.
5. Formulate element stiffness matrix for axisymmetric elements.

Unit Wise Syllabus:

Unit 1: Introduction: 6 hrs

Elementary theory of Elasticity: stress-strain, strain displacement relations, plane stress and plane strain problems. Equations for two and three dimensional problems Finite element procedure, Principle of minimum potential energy, Galerkin approach, Rayleigh Ritz method

Unit 2: Discretization: 6 hrs

Discretization of continuum, displacement model, application to linear spring, bars with constant and variable cross sections subjected to axial forces. Numbering of nodes, minimization of band width. finite representation of infinite bodies

Unit 3: 2-D Problems :   6 hrs

Development of element stiffness matrix and nodal load vector for beam and truss elements. Transformation of matrix, 2-D elements of triangular shapes for plane stress and plane strain problems. Application of FE method to beam and plane truss.

Unit 4: Convergence requirements: **6 hrs**

Convergence requirements selection of order of polynomial, confirming and non confirming elements, element aspect ratio, Pascal's triangle.

Unit 5: Isoparametric element: **6 hrs**

Shape function, Cartesian and Natural coordinate system, Lagrange polynomials, concept of isoparametric element, sub parametric, super parametric elements, 1-D and 2-D isoparametric element.

Unit 6: 3-D elements, Axi symmetric problems: **6 hrs**

Various 3-D elements, development of element stiffness matrix and nodal load vector for tetrahedron element. Axisymetric problems, Formulation of stiffness matrix of Axi -symmetric elements.

References:

1. O.C.Zienkiewicz & R.L.Taylor, The Finite Element Method Vol.I & II, Tata McGraw Hill
2. J.N.Reddy, 'An introduction to the Finite Element Method'. Tata McGraw Hill Pub.
3. R. D. Cook, Concept and Application of Finite Element Analysis, John Wiley & sons
4. Hutton D.V., Fundamentals of Finite Element Analysis, Tata McGraw Hill Pub.
5. C. S. Desai & J. F. Abel, Introduction to the Finite Element Method, CBS Pub.
6. C. S .Krishnamoorthy, Programming in the Finite Element Method, Tata McGraw Hill
7. T. R. Chandrupatla and Belegundu, Introduction to the Finite Element in Engineering-
8. Prentice Hall of India, pvt.ltd
9. Bathe K.J., Finite Element Procedures, PHI learning pvt.ltd
10. Y.M.Desai, T.I Eldho, Finite Element Method with application in Engineering, Pearson, Delhi.

CE 4121 Advanced Structural Design – (Program Elective II)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing %		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description
This course deals advanced design in steel and concrete materials, of building components that range from foundations to the entire superstructure.

Course Learning Outcomes:
After the completion of this course, students will be able to:
1. Analyze and design RC structures and their components like building frames, flat slab, retaining walls, water tanks and piles.
2. Use relevant codes and apply codal provisions for analysis and design of RC structures and their components.
3. Analyze the slabs of irregular shapes by yield line theory and design rectangular and circular slabs for yield moments.
4. Show detailing of reinforcement in structural components of building frames, flat slab, retaining walls, water tanks and piles.

Unit Wise Syllabus:
Unit: 1 Yield line analysis   6 Hrs
Introduction, rules governing possible yield line patterns, yield line patterns at collapse of various shapes of slab with different support conditions. Two methods for determining ultimate loads on slab: virtual work method and equilibrium method. Analysis and design of simply supported rectangular and circular slabs.

Unit: 2   Flat slab   6 Hrs
Introduction, analysis of flat slab panel by direct design method, equivalent frame method, design of flat slab, detailing of reinforcement.

Unit: 3   Cantilever and counter fort retaining walls   6 Hrs
Introduction, classification, drainage arrangements for retaining walls, stability requirements of retaining wall, design of cantilever retaining wall, design of counterfort retaining wall, detailing of reinforcement.

Unit: 4   Building frames   **6 Hrs**

Introduction, analysis of building frames by method of substitute frames, design of RC building frames, design of RC portal frames, detailing of connections.

Unit: 5 Overhead water tanks   **6 Hrs**

Analysis and design of overhead circular water tanks with flat bottom, spherical and conical tank roofs, ring beams, staging. Detailing of reinforcement in the components of overhead water tank.

Unit: 6 Pile foundation   **6 Hrs**

Introduction to pile foundations, structural design of reinforced concrete piles, design of pile cap. Detailing of reinforcement.

References:

1. Sinha and Roy - Fundamentals of Reinforced Concrete, 3rd Edition, S. Chand and Company Ltd, New Delhi
2. A. K. Jain - Reinforced Concrete Design
3. Karve and Shah - Limit State Theory and Design, Structures Publications, Pune
4. P. C. Varghese - Limit State Design of Reinforced Concrete, 2nd Edition, Prentice Hall of India, New Delhi
5. IS: 456-2000
6. IS:3370- 1 to 4- Code of Practice for concrete structures for the storage of liquids.
7. N. Unnikrishna Pillai/ Devdas Menon - Reinforced Concrete Design, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi
8. N. Krishna Raju - Advanced Reinforced Concrete Design, 2nd Edition, CBS Publishers Distributors Pvt. Ltd.
9. Chu-Kai Wang, Charles G. Salmon - Reinforced Concrete Design, 4th Edition, Harper International Edition
10. S. K. Mallick, A. P. Gupta - Reinforced Concrete, 2nd Edition, Oxford & IBH Publishing Company, Mumbai
11. P. Purushothaman - Reinforced Concrete Structural Elements, Tata McGraw- Hill Publishing Company Limited, New Delhi
12. Ferguson, Breen, Jivsa - Reinforced Concrete Fundamentals, 5th Edition, John Wiley & Sons, New York
13. T. S. MacGinley & B. S. Choo - Reinforced Concrete, 2nd Edition, E. & F. N. Spon, London
14. P. C. Varghese - Advanced Reinforced Concrete Design, 2nd Edition, Prentice- Hall of India, New Delhi

CE 4151: Solid and Hazardous Waste management (Program Elective I)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
3	-	--	3	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description
The course would cover general introduction including definition of solid wastes –municipal waste, biomedical waste, hazardous waste, e-waste; legal issues and requirements for solid waste management; sampling and characterization of solid waste; analysis of hazardous waste constituents including QA/QC issues; health and environmental issues related to solid waste management; steps in solid waste management-waste reduction at source, collection techniques, materials and resource recovery/recycling, transport, optimization of solid waste transport, treatment and disposal techniques (composting, vermi-composting, incineration, non-incineration thermal techniques, refuse derived fuels, landfilling); economics of the onsite vs. offsite waste management options (individual vs. common treatment/disposal practices, integrated waste management; and waste minimization and concepts of industrial symbiosis and industrial ecology.

Course Learning Outcomes:
After successfully completing the course, Student will able to:
1. Determine solid waste properties and quantity for municipal and hazardous waste.
2. Illustrate health effects by municipal, hazardous waste.
3. Design Physicochemical and biological treatment and landfill site for solid waste.

Pre-requisites:
Environmental science

Unit Wise Syllabus:
Unit 1: Municipal solid and Hazardous waste management fundamentals   **9 hrs**

Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options; Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects

Unit 2: Physicochemical Treatment of Solid and Hazardous Waste   **9 hrs**

Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation); ground water contamination and remediation;

Unit 3: Biological treatments and Landfill design   **9 hrs**

Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration

Unit 4: Relevant Regulations

                                                                                      9 hrs

Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; flyash rules; recycled plastics usage rules; batteries (management and handling) rules

References

1. Dr. A. D. Bhide, "Solid Waste Management", Published by Indian National Scientific Documentation Centre, New Delhi, 2nd edition 1984.
2. Gorge Tchobanoglous, "Solid Waste Management" , Published by McGRAW-HILL: New York 2nd Edition 1995.
3. Pavoni, "Solid Waste Management Hand Book" , Published by A Willy – Interscience Publication ISBN- 047187711-5.
4. Gottas, "Composting", Published by World Health Organisation, Geneva,1956.
5. Manual on Municipal Solid Waste Management by Ministry of Urban Development of Govt. of India, 2004.
6. Peavy & Rowe, "Environmental Engineering', Published by New York : McGraw-Hill

Final Year B. Tech. Civil Engineering – Sem. VIII
CE 4241 Geo-informatics for Engineering (Program Elective II)

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

This course introduces the hardware and software components of Geographic Information Systems and reviews GIS applications. Topics include data structures and basic functions, methods of data capture and sources of data, and the nature and characteristics of spatial data and objects. Upon completion, students should be able to identify GIS hardware components, typical operations, products/applications, and differences between database models and between raster and vector systems.

Course Learning Outcomes:

After successfully completing the course, Student will able to:
1. Apply GIS tool for solving civil engineering industry problem
2. Perform infrastructural planning
3. Analyse spatial data and query analysis
4. Develop base and thematic maps
5. Develop projects and device solution for the area.

Unit Wise Syllabus:

UNIT 1 : Fundamentals of GIS   6 Hrs
GIS- Definition, advantages of digital maps.- Information Systems, Modeling Real World Features Data. Case study-I

UNIT 2: Topology & Techniques   6 Hrs
Data Formats – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Database Management – Database Structures, Files; Standard Data Formats, Compression Techniques.

UNIT 3: Spatial data & relationship   6 Hrs
Types of Errors, Editing and Error Rectification, Types of Topology, Modeling topological Relationships, Tolerances.

UNIT 4: Analysis and Modeling   **6 Hrs**

Proximity Analysis, Overlay Analysis, Buffer Analysis, Network Analysis, Spatial Auto Correlation, Gravity Modeling, DTM/DEM, Integration with Remote Sensing data, Case study – II

UNIT 5: GIS Project Planning and Implementation   **6 Hrs**

Understanding the Requirements, Phases of Planning, Specifications, Data Procurement, Tendering, Human Resources, Back Up, Monitoring Progress.

UNIT 6:   Interpolation & Various applications of GIS in Civil engineering   **6 Hrs**

Introduction to Interpolation - Global Methods of Interpolation - Local Methods of Interpolation- applications in Planning – Management - Tax Mapping - Emergency evacuation – Environment - Transport/Logistics and Analysis, Case study –III

References

1. M.Anji reddy - Remote sensing and geographical information systems: fourth edition, BS publication,2012
2. John E. Harmon & Steven J. Anderson., The design and implementation of Geographic Information Systems, John Wiley & Sons, 2003
3. C.P.Lo & Albert K. W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice Hall India Pvt.Ltd, 2002.
4. K. Elangovan - GIS: Fundamentals, Applications and Implementations Handcover publication 2010
5. Shahab Fazal - GIS basics New age publication Delhi 2008.
6. The Esri Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics Edition 1 Andy Mitchell ESRI Publication 2012.

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4311: Advanced Foundation Engineering (Program Elective I)

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	-	--	3	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description
The course covers analysis and design of shallow foundations and limitations of methods, advanced analysis methods. The course will require students to carry out analysis and design for offshore structure footings, including suction caissons, through project based learning. This course will build on your knowledge and understanding of soil behavior and the application of soil mechanics to the design of foundations. You will understand detailed design issues related to both deep and shallow foundations and be able to apply modern soil mechanics principles and analytical techniques including numerical modeling of soil structure interaction problems using appropriate numerical software. You will be able to understand the relative importance of key soil parameters and how these may be derived through appropriate element testing or interpretation of site investigation data.

Course Learning Outcomes:
After successful completion of this course the student will be able to:
1. Interpret wells, caissons foundation & cofferdams in soil.
2. Discriminate soil structure interaction between static & dynamic analysis.
3. Illustrate the application of various modern techniques in construction of foundation.
4. Justify the appropriate method for the design of foundation.

Prerequisites
1. Fluid Mechanics.
2. Soil Mechanics.
3. Foundation Engineering.

Unit Wise Syllabus:

| Unit I | Well, Caissons Foundation and Cofferdams | 09 |

Well, Caissons Foundation and Cofferdams: Components of wells, types, methods of construction, tilt and shift, remedial measures. Dewatering- Well point systems-Single, multiple, well point, dewatering by electro osmosis

Unit II	**Sheet Pile**	09

Types and material used for sheet piling, use of sheet pile walls, anchorages for sheet piling, Undereamed Pile Foundation.

Unit III	**Modern Foundation Techniques**	09

Anchoring for foundation, Stone columns, Preloading technique, Civil engineering application of geo synthetics, geo textile & geo membrane, Jet grouting. Soil stabilization

Unit IV	**Soil - Structure Interaction**	09

Idealized soil, foundation and interface behavior. Elastic models of soil behavior; Elastic-plastic and time dependent behavior of soil. Fundamentals of Seismic Soil-Structure Interaction; Liquifaction, Analysis of Soil-Structure Interaction using FEM methods & softwares(application)

Reference Books

1. Alam Singh and Chowdhaly G.R. - Soil Engineering in Theory and Practice- (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. Punmia B.C. - Soil Mechanics and Foundation Engg. - (2005), 16th Edition Laud Publications Co, New Delhi.
3. B.J. Kasamalkar - Foundation Engineering by Pune Vidyarthi Griha Prakashan, Pune
4. Bowles J.E. - Foundation Analysis and Design- (1996), 5th Edition, McGraw Hill Pub. Co. New York.
5. Murthy V.N.S. - Soil Mechanics and Foundation Engineering- (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
6. Soil Mechanics and Foundation Engg - K.R. Arora (Standard Publishers).
7. W.L.Schroeder, S. E. Dickenson &Don C. Warrington - Soils in Construction- by Dorling Kindersley India Pvt. Ltd. (2012).
8. Steven L. Kramer - Geotechnical Earthquake Engineering, Prentice Hall Inc.(1996)

Final Year B. Tech. Civil Engineering – Sem. VIII
CE 4141: Air Pollution and Control (Program Elective II)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing %		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

As a comprehensive course, it introduces the effects of air pollutants on human beings and environment, the sources of air pollution, and the physical and chemical behavior of pollutants in the atmosphere. Also, it covers legislation and regulation; control technologies and future trends toward preventing air pollution.

Course Learning Outcomes:

After successfully completing the course, Student will able to:

1) Explain structure of the atmosphere Air Pollution, Scales of air pollution
2) Interpret on sources of air pollution natural and artificial, air pollution Episodes
3) Explain effect of different air pollutants on man, animals and plants.
4) Design Stack height and explain meteorology, transport and control mechanism
5) Explain noise pollution.

Unit Wise Syllabus:

Unit 1: Structure of Atmosphere   **6 hrs**

Definition and Scope of Air Pollution, Study of bio-sphere and atmospheric structure, Scales of air pollution Sources: natural and artificial, Classification of pollutant, quantity and composition of particulate & gaseous pollutant, Units of measurements

**Unit 2: Sources and Effects of Air Pollution**   **6 hrs**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion,
Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

Unit 3: Transport of Air Pollution   **6 hrs**

Elements of atmosphere and dispersion of pollutants – Meterological factors – Wind roses – Lapse rate – Atmospheric stability and turbulance – Plume rise – Dispersion of pollutions – Gaussian dispersion models – Applications.
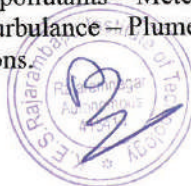
Unit 4: Control of Air Pollution   6 hrs

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic prescipitation – Selection criteria for equipment, gaseous pollutant control by adsorption & absorption, condensation, combustion – Pollution control for specific major industries.

Unit 5: Air Quality Management   6 hrs

Air quality standards – Air quality monitoring – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment – Methods.

Unit 6: Noise Pollution & Control   6 hrs

Sound and Noise: Sources of noise pollution – environmental and industrial noise; effects of noise pollution - fundamentals of sound generation - propagation, sound measurement - sound level meters – types, components, Noise prevention & control measures, environmental and industrial noise - noise control legislation.

References

1. Wark and Warner - Air Pollution, Published by McGraw-Hill
2. Martin Crawford - Air Pollution, Published by New York : McGraw-Hill, 1976
3. R. D. Ross - Air Pollution and Industry, Published by New York [etc.] : Van Nostrand Reinhold Company
4. Rao and Rao - Air Pollution, Published by Tata McGraw-Hill Education, 1989
5. Peavy & Rowe - Environmental Engineering, Published by New York : McGraw-Hill
6. Stern - Air Pollution, Published by Elsevier Store

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4211   Advanced Construction Materials (Program Elective-I)

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	-	--	3	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15				
				ESE	50	40		--	--

Course Outcomes
Engineering design and problems of soils, rock, asphaltic and Portland cement concretes, brick and block masonry construction. Emphasis will be upon soils and soil quality control testing. The aim of this course is to evaluate knowledge about the behaviour and performance of more specialised construction materials, including composites, as applied to structures built from diverse materials.

Course Learning Outcomes:
After successful completion of this course the student will be able to:
1. Summarize the properties of various advanced & special materials of construction.
2. Recommend the use of appropriate building materials to suit the construction requirements.
3. Illustrate the application methods of various building materials for construction works.

Unit Wise Syllabus:

Unit 1: Advanced Building Materials   09 Hrs

Glass- introduction, constituents and classifications, properties, non-weathering materials – flooring and facade materials, structural glazing, roofing materials, waterproofing & damp-proofing materials, polymers in civil engineering.

Unit 2: Admixtures and Construction Chemicals   09 Hrs

Mineral admixtures- fly ash, silica fume, ground blast furnace slag, rice husk ash, metakaolin, activity of Pozzolana, Applications. Construction chemicals – classification and applications

Unit 3: Metals   09 Hrs

Steels and special alloys of Steel, metal working processes, heat treatment of steel, Thermo-Mechanically Treated (TMT) bars, steel for RCC. Forms of steels as building material, Aluminum and its alloy, applications

Unit 4: Special Materials   09 Hrs

Smart Materials - Classification, applications, Smart concrete, Bacterial concrete, Polymer concrete, Light transmitting concrete, decorative concrete. Geosynthetics and its applications, Ferrocement- materials construction methods, durability and applications. Nanocomposite materials

References:

1. Santhakumar A.R., "Concrete Technology", Oxford University press, New Delhi. 2007.
2. Mamlouk, M.S. and Zaniewski, J.P., "Materials for Civil and Construction Engineers", Prentice Hall Inc., 1999.
3. Ashby, M.F. and Jones, D.R., "Engineering Materials 1: An introduction to Properties", applications and designs, H.H. Elsevier Publications, 2005.
4. Shan Somayaji, "Civil Engineering Materials", Prentice Hall Inc., 2001.
5. Deucher, K.N, Korfiatis, G.P and Ezeldin, A.S., "Materials for civil and Highway Engineers", Prentice Hall Inc., 1998.
6. Shetty M.S., "Concrete Technology: Theory and Practice", S.Chand & Company Ltd., 2005.
7. S. K. Duggal, "Building Materials", New Age International Publications, Third Revised Edition, New Delhi, 2003.
8. S. P. Shah and S. H. Ahmad, "High Performance Concrete: Properties and Application", Mc-Graw-Hill Inc. Pub. New York,1994.

CE 4231   Project Appraisal (Program Elective-I)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
				ISE	20			--	--
3	-	--	3	UT 1	15	40	40	--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description:

Apprise the students of the appraising criteria and methods of Lending Institutions. Preparation of the Project Report and how to go about the project. Evaluation of the Projects. This course will take a holistic approach to Project Appraisal, beginning with examining what projects/policies, costs, benefits and project planning actually are, covering of the valuation of non-market effects and commodities, such as water pollution, and identifying ways in which such impacts can be valued and incorporated into the Project Appraisal, and culminating with a discussion of risk and uncertainty analysis. Note that PA can and is applied to policy analysis as well as project-level appraisal in this course.

Course Learning Outcomes:

After successfully completing the course, Student will able to:
1) Apply project appraisal performance measurements to a project,
2) Analysis project on basis of market & demand, technical feasibility, financial feasibility & cash flow.
3) Interpret social cost benefit analysis of Civil Engineering project.
4) Estimate environmental & social impact of project.

Unit Wise Syllabus:

Unit 1: Introduction   9 Hrs

Project appraisal, evaluation & overview. What is project, project planning techniques, basic needs. Measurement of project performance. Generation & screening of project ideas.

Unit 2: Project Analysis   9 Hrs

Market & demand analysis, technical analysis. Financial Analysis: Net present value, Economic factors, Benefit cost ratio, Internal rate of return, Payback period, Cash flow analysis.

Unit 3: Social Cost Benefit Analysis   **9 Hrs**

Basic steps in social cost benefit analysis, Direct-indirect costs & benefits – tangible, intangible & their conversion, Applications of CBA.

Unit 4: Environmental & Social Impact Analysis   **9 Hrs**

Introduction, Laying the foundation. Impact assessment, reporting & decision making. Impact mitigation/enhancement & monitoring.

References

1. Prasanna Chandra, "Project preparation, Appraisal, Budgeting and Implementation".
2. E. J. Mishan ,"Cost Benefit Analysis".
3. Geoffery G. Meredith R. E. Nelson & P. A, "The Practice of Entrepreneurship".
4. "Project Appraisal & Impact Analysis", SOAS University of London. Module introduction & overview.
5. Kuiper, "Water Resources Project Economics"
6. Harold Kerzner, "Project Management", CBS Publishers & Distributers.

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4251 Construction Safety (Program Elective I)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
3	-	--	3	ISE	20			--	--
				UT 1	15	40	40	--	--
				UT 2	15				
				ESE	50	40		--	--

Course Desription

The purpose of this course is to promote workplace safety and health and to make workers more knowledgeable about workplace hazards and their rights. To provide students with information and skills necessary to work safely in the Construction Industry. This course will give students insight into the various OSHA Standards related to Construction work by examining each Standard closely. A secondary goal of this course is learn the role of the Competent Person for the various Construction Safety Standards.

Course Learning Outcomes:

After successfully completing the course, student will able to:

1. Suggest safety precautions to be taken during the execution of various construction works.
2. Analyze possible hazards and accidents in construction projects.
3. Interpret various legal aspects of safety in construction.

Unit Wise Syllabus:

Unit 1: Safety in Construction   09 Hrs

Indian construction industry, challenges before construction industry in India, safety hazard, safety precautions in construction, safety committee and its function. Role of govt. in safety promotions. Safety education & training, safety audit, personal protective equipments (PPE). Roles & responsibility of safety officers, duties of safety officers. Safety signs and symbols.

Unit 2: Hazards of Construction and Prevention   09 Hrs

Excavations, basement and wide excavations, trenches, shafts-scaffolding, safety hazards, scaffolding inspection checklist. Accidents- types, causes- unsafe act & unsafe condition, prevention techniques, accident reporting & investigation. Construction safety in high rise buildings, working on contaminated sites, safety in demolition work, fire hazards.

Unit 3: Safety in Handling Construction Machinery   09 Hrs

Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist, builder's hoist, winches, chain pulley blocks, use of conveyors - concrete mixers, concrete vibrators. Safety in earth moving equipments- excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools.

Unit 4: Legal Aspects of Safety in Construction   09 Hrs

Acts & regulations related to constructions- Building and other construction workers' act-1996, Employees State Insurance (ESI) Act, 1948. Occupational health Laws, occupational safety & health act (OSHA), employer and employees- duties and rights.

Reference Books

1. Richard D. Hislop, "Construction Site Safety", Lewis Publications, New York, Washington, D.C. 1999.
2. K. T. Narayanan, "Safety, Health and Environmental Handbook", McGraw Hill Education (India) Pvt. Ltd., New Delhi. 2015.
3. Susan Fink, "Health and Safety Law for the Construction Industry" , Thomas Telford books, London, 1997.
4. R. K. Jain, Sunil S. Rao, "Industrial Safety Health & Environmental Management Systems", Khanna Publication, 2015.
5. R. K. Mishra, "Construction Safety", AITBS Publisher, India, 2013.
6. "ISI for safety in Construction", Bureau of Indian Standards.

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks %)			Practical (Marks %)	
					Max	Min for Passing		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

Transportation has always played an essential role in the development of society, originally with regard to trade routes and harbours, but more recently with regard to land- and air-based systems as well. It is the transportation engineer's responsibility to plan, design, build, operate and maintain these systems of transport, in such a way as to provide for the safe, efficient and convenient movement of people and goods.

Course Learning Outcome:-

After successful completion of this course Students should be able to:-

1. Explain principles and necessity of town planning.
2. Interpret all public Amenities useful for town planning.
3. Compare most efficient traffic management system for town planning.
4. Choose public utility services for rapid transportation.
5. Criticize planning on various Central Acts and State Acts.

Unit Wise Syllabus:

Unit 1: TOWN PLANNING PRINCIPLES: 6 hrs

Objects of town planning – Economic justification for town planning - Principles of Town planning - Necessity of town planning - Site for an ideal town - Requirements of new towns - Planning of a modern town - Present position of Town Planning in India. ZONING: Meaning of the term - Uses of land, objects and Principles of Zoning - Advantages of Zoning - Importance of Zoning - Aspects of Zoning – Transition Zone – Economy in Zoning - Zoning powers - Maps for Zoning.

Unit 2: HOUSING AND SLUM 6 hrs

General - Importance of housing - Demand for houses - Building site - Requirements for residential buildings -Design of residential areas - Rural Housing - Agencies for housing - Investment in housing - HUDCO – CIDCO - Housing problems in India. SLUMS: General - Causes of slums - Characteristics of slums - Effects of slums - Slum clearance - Problems in slums rehabilitation - Improvement Works - Open plot scheme - Slum clearance and row housing - Prevention of slum formation.

Unit 3: PUBLIC AMINITIES AND MASTER PLAN   6 hrs

General – Suitable Location of Public Buildings - Town centers - Grouping and Requirements of Public buildings – Green House– Civic aesthetics-Necessity of open spaces - Location of urban green spaces - Park systems - Park design – Finance for parks – Parkways – Playgrounds - Space standards. MASTER PLAN: General – Objects – Necessity - Factors to be considered - Data to be collected - Drawings to be prepared - Features of master plan - Planning standards – Report – Stages of preparation-Objects of re-planning – Analyzing the defects of existing towns - Data to be collected –difficulties in Master Planning existing towns / cities - Urban renewal projects-merging of suburban areas – Decentralization – Refuses of Towns – Refuse disposal methods

Unit 4: TRAFFIC MANAGEMENT   6 hrs

General - Objects - Requirements of good city road – Factors to be considered – Classification of urban roads – Types of street systems - Through and By-pass roads – Outer and inner ring roads - Expressways – Freeways –Road aesthetics. – Traffic survey - Traffic congestion – Traffic control - Traffic diversion - Road junction –Parking - Traffic capacity of road - One way traffic - Road traffic problems – Use of islands and flyovers at crossings – causes of road accidents.

Unit 5: URBAN TRANSPORTATION PLANNING   6 hrs

Airports – Location - size - Noise control - Parts of an airports - Betterment and compensation – City blocks - Green belt - Public utility services - Rapid transit – Site suitability analysis Location of Bus Terminus, Whole sale markets, Exhibition Centers etc., – Location for water/sewage treatment plants, location for waste disposal etc.,

Unit 6: PLANNING LEGISLATION   6 hrs

Significance and Concept of Law- Land Acquisition Act- Case Studies Related to Land Acquisition Act- Indian Constitution and Evolution of Planning Legislation- Evolution of Planning Legislation- Policy, Acts and Laws, Significance of Land Development Control

References

1. S. C. Rangwala "Town Planning" Charotar Publisher, (2011)
2. K. S. Rangwala and P. S. Rangwala,. "Town Planning" Charotar Publishing House, 15th Edition,1999..
3. National Building Code of India- Part-III. (2005).
4. Municipal and Panchayat bye-laws, CMDA Rules and Corporation bye-laws.
5. KA. Ramegowda, Urban and regional planning ,
6. Principles and practice of town and country planning Lewis B. Keeble, Estates Gazette, 2010
7. M G Shah, C M Kale, S Y Patki- "Building Drawing", Tata McGraw hill Publication, Fifth Edition, 1981.
8. Dr. N. Kumara Swamy, A. Kameswara Rao, "Building Planning and Drawing", 8th Revised Edition, 2015.

Final Year B. Tech. Civil Engineering – Sem. VIII
CE 4381 Optimization Techniques (Program Elective II)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing %		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course description:

This course introduces the principal algorithms for linear, network, discrete, nonlinear, dynamic optimization and optimal control. Emphasis is on methodology and the underlying mathematical structures. Topics include the simplex method, network flow methods, branch and bound and cutting plane methods for discrete optimization, optimality conditions for nonlinear optimization, interior point methods for convex optimization, Newton's method, heuristic methods, and dynamic programming and optimal control methods.

Course Learning Outcomes:

After the completion of course students will be able to:
1. Identify the necessity and scope of optimization techniques.
2. Analyse the managerial problem through models and arrive at an optimal solution or decision.
3. Explain the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
4. Construct and anlyse Mathematical Decision Model.
5. Explain applications of Queuing theory.

Unit Wise Syllabus:

Unit : 1 Introduction   04 Hrs

Introduction: Importance of optimization techniques, Applications of Optimization techniques in construction industry, Operations Research models, Phases of OR, Limitations of OR Linear programming: Formulation, graphical solution, simplex method,

Unit : 2 Linear Programming Problem   08 Hrs

Formulation of LPP, Solution by Graphical Method, Simplex Method, Big M Method, Sensitivity analysis

Unit : 3 Transportation Problem/Assignment Problem   06 Hrs

Transportation Problem and its variants, Assignment problem and its variants.

Unit : 4 Decision Theory   06 Hrs

Steps in decision making approach, Decision making environments, Game Theory, Characteristics of game, Game model, Rules for game theory, Mixed Strategies (2×2 games), ($2\times$n)

Unit : 5 Non-Linear Programming   06 Hrs

Introduction to Non-Linear Programming, Dynamic programming and integer programming, Forecasting techniques.

Unit : 6 Queuing Theory   06 Hrs

Applications of Queuing models, elements of Queuing system, Operating characteristics of a queuing system, Waiting time and idle time costs, Introduction to Simulation, Advantages of the simulation technique, Applications of Simulation.

References

1. G.V. Shenoy - Operations Research for Management, U.K. Srivastav, S.C. Sharma - Wiley Eastern Limited
2. Premkumar Gupta and Dr. D. S. Hira - Operations Research
3. Taha, H.A., Operations Research - An Introduction, Prentice Hall, (7th Edition), 2002.
4. S. S. Rao - Optimization, Wiley Eastern Ltd
5. Sharma J.K - Operation Research Theory And Applications

CE 4241: Disaster Management (Program Elective II)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing %		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description
All countries face a wide range of hazards, both natural and man-made, that have the potential to result in catastrophic damage. Despite actions taken by local emergency management professionals, international trends show that the economic and social impact of disaster has increased around the world. This is especially true in the developing world, where large-scale disasters can result in enormous loss of life as well as considerable economic damage.

Course Learning Outcomes:
After successfully completing the course, Student will able to:
1. Analyze effects of natural and manmade disasters.
2. Demonstrate disaster management program.
3. Analyze vulnerable conditions and risk assessment.
4. Construct layout for sanitary landfill site and composting site
5. Describe stakeholders role in disaster response.

Unit Wise Syllabus:

Unit 1: Natural Disasters   6 hrs
Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion

Unit 2: Man Made Disasters   6 hrs
Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

Unit 3: Disaster Management   6 hrs
Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Unit 4: Risk Assessment And Vulnerability Analysis   6 hrs

Disaster preparedness plan, use and application of emerging technologies, role and responsibilities of various agencies and mitigation strategies

Unit 5: Disaster Response   6 hrs

Immediate impact and post-impact phase of disasters, Disaster Response Plan, Communication, Participation, and Activation of Emergency Preparedness Plan,

Logistics Management, Needs and Damage Assessment, Disaster Response: Central, State, District, and Local Administration, Role of Multiple Stockholders in Disaster Response.

Unit 6: Rehabilitation, Reconstruction And Recovery   6 hrs

Damage Assessment, Role of Various Agencies in Disaster Management and Development, Information Management Structure, Parameters of Vulnerability, Development of Physical and Economic Infrastructure, Creation of Long-term Job Opportunities and Livelihood Options, Role of Housing/Building Authorities, Education and Awareness, Long-term Recovery, Long-term Counter Disaster Planning

References

1. Reiter, L., Earthquake Hazard Analysis: Issues and Insights, Columbia University Press, 2000.
2. Mileti D.S., Disasters by Design: A Reassessment of Natural Hazards in United States; The National Academic Press, 1999
3. R.Anbalagan, B. Singh, D.Chakraborthy and A. Kohli - A field manual for landslide investigations, DST, Government of India, New Delhi
4. Mac Daniels T.L. and Small M.J. (eds.)Risk Analysis and Society: An Interdisciplinary Characterization of the Field, Cambridge University Press, 2004
5. Carter, W.N., Manila, ADB - Disaster Management: A Disaster Managers Handbook, 2006.
6. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000.

Final Year B. Tech. Civil Engineering – Sem. VIII
CE4261 Building Services and Maintenance (Program Elective II)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing %		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description:

An introductory building maintenance class introduces students to the job duties of maintenance mechanics and other workers in building repair or building maintenance. It lays the foundation for further building maintenance courses by providing an overview of the field, including carpentry, plumbing, masonry, grounds maintenance, electrical procedures, environmental control systems and horticulture. The course is designed to provide both lectures and hands-on learning.

Course Learning Outcomes:

After the completion of the course students will be able to:
1. Develop asset management plan,
2. Perform structural assessment of civil engineering structures,
3. Decide repairs and preventive actions required for buildings,
4. Develop detailed maintenance plan,
5. Select structural strengthening method and material,

Unit Wise Syllabus:

Unit: 1 Defects and deterioration mechanism in buildings   6 Hrs

Introduction, defect identification and their causes, Sources of defects, Influence of environment and micro climate.

Unit: 2 Management and maintenance systems   6 Hrs

Introduction and history, asset management, Standards (Guidelines), Asset management for bridges, multistory buildings, Civil engineering structures, Elements/Factors in asset management system.

Unit: 3 Diagnosis of deterioration   6 Hrs

Inspection, testing and preliminary diagnosis, Interpretation and evaluation, Preliminary structural assessment, detailed structural assessment.

Unit: 4   Protection, Prevention and repair   **6 Hrs**

Introduction, Performance requirements for repaired structures, Classification of repairs, Performance of repair on service, Selection of repair option.

Unit: 5   Building maintenance planning   **6 Hrs**

Introduction to planning principles, Objectives, Components of planning, Scope of maintenance planning, Planned inspection cycles, Replacement decisions, Planned maintenance program.

Unit: 6   Structural strengthening   **6 Hrs**

Introduction, The market for strengthening, Strengthening technologies, Advantages & Disadvantages of FRP, Materials for Structural Strengthening.

References:

1. George Somerville - Management of deteriorating concrete structures, 2008, Taylor & Fransis, London.
2. Thad Godish - Sick buildings, 1994, CRC Press.
3. L. C. Hollaway and M. B. Leeming - Strengthening of reinforced concrete structures, 1999, CRC Press.
4. Barrie Chanter - Building maintenance management, 2nd Edition, 2007, Blacknell Publishers.

CE 4291: Green Technologies in Civil Engineering (Program Elective I)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
2	-	--	2	ISE	20	40	40	--	--
				UT 1	15			--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description:

Green Technologies is a highly interdisciplinary degree program that emphasizes green systems and the environment, energy technology and efficiency, and sustainability and society. The discipline seeks opportunities for alternative sourcing, conservation, efficiency and repurposing through an understanding of product life cycles from origins to recycling or inevitable disposal. Green technologists will design products, processes and complex infrastructure systems to promote sustainable attributes of importance to the environment and the global community.

Course Learning Outcomes:

After successfully completing the course, student will able to:
1. Explain the economic benefits of a green building
2. Classify the terms and the construction methodologies between "traditional building" and "green building".
3. Evaluate the status of building for various green building rating system

Pre-requisites

Environmental science

Unit Wise Syllabus:

Unit 1: Introduction to Green Technology   09 Hrs

Sustainable site selection orientation, building envelop, building plan layout, design of doors and windows, natural ventilation, solar energy, use of solar energy for water heating, solar concentrators, solar photovoltaic panels, direct and indirect lighting, comparison of various lighting devices-electric tubes, incandescent lamps, CFL and LED lamps, indirect lighting devices-light tubes, fiber optic, Fresnel lens.

Unit 2: Embodied Energy and Rating System in Green building   09 Hrs

Concept of Embodied energy of various common building materials. Energy and water audit of building. Various rating systems in Green building, LEED criteria, USGBC, IGBC Green rating, GRIHA criteria, Eco housing, Environmental clearance of buildings.

Unit 3: Water Management   **09 Hrs**

Water efficiency, Water Efficient Landscaping- Rain water harvesting, potable water and bore well recharging, minimization of water use, dual flush, Waterless urinals, Smart controlled water tabs, Recycling of treated waste water for different non potable use, Domestic solid waste – segregation, green materials.

Unit 4: Recycling of Building Materials   **09 Hrs**

Recycling of building materials, walls, roofs and floors, Interial non structural element, Construction waste management, Materials use, Recycled content, Use of fly ash, foundry sand and other inert solid wastes in building, life cycle analysis, Construction phase, Operation phase, demolition and land use.

References

1. Michael Bauer, Peter Mösle and Michael Schwarz, "Green Building – Guidebook for Sustainable Architecture" Springer Publication, ISBN 978-3-642-00634-0.
2. Kibert, C. J. "Sustainable construction: Green building design and delivery", Wiley, Hoboken, NJ.
3. "LEED for homes green building rating system", U.S. green building council, GBC green building rating system".
4. "Green Rating for Integrated Habitat Assessment (GRIHA)".
5. "Building research establishment environmental assessment method. Design and procurement pre-assessment estimator BREEAM
6. "Eco Housing green building rating system".
7. "Comprehensive assessment system for building environmental efficiency", CASBEE for new construction: technical manual 2004 edition.
8. "National Building Code 2005".

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4461: Industrial Waste Treatment (Program Elective I)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
2	-	--	2	ISE	20			--	--
				UT 1	15	40	40	--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description:
Green Technologies is a highly interdisciplinary degree program that emphasizes green systems and the environment, energy technology and efficiency, and sustainability and society. The discipline seeks opportunities for alternative sourcing, conservation, efficiency and repurposing through an understanding of product life cycles from origins to recycling or inevitable disposal. Green technologists will design products, processes and complex infrastructure systems to promote sustainable attributes of importance to the environment and the global community.

Course Learning Outcomes:
After successfully completing the course, student will able to:
4. Explain the economic benefits of a green building
5. Classify the terms and the construction methodologies between "traditional building" and "green building".
6. Evaluate the status of building for various green building rating system

Pre-requisites
Environmental science

Unit Wise Syllabus:

Unit 1:   **06 Hrs**
Use of water in industry, sources of wastewater, quality and quantity variations in waste discharge, water budgeting, characterization and monitoring of wastewater flow, stream standards and effluent standards.

Unit 2:   **06 Hrs**
Waste volume and strength reduction, in-plant measure, good housekeeping, process change, leakage prevention, segregation and recycling Neutralization, equalization and proportioning of waste

Unit 3:   **06 Hrs**
Water Quality monitoring of Streams, Self-purification of streams, B.O.D. reaction rate, D.O. sag curve and D.O. deficit calculations, Miscellaneous methods of dissolved solids removal, sludge disposal methods

Unit 4:   **06 Hrs**

Different types of waste treatment & their selections, Development of treatment flow diagram based on characteristics of waste,

Unit 5:   06 Hrs
Manufacturing processes in major industries, water requirements, wastewater ources, composition of wastes, Viz. sugar, distillery, dairy, pulps, paper mill, fertilizer, annery, chemical, steel industry, power plants, textile Treatment flow sheets, lternative method treatment, factors affecting efficiency of treatment plant

Unit 6:   06 Hrs
Water pollution control act, organizational set up of central and state boards for water p control, classification of river on water use, minimal national standards, socio-economi aspects of water pollution control

References
1. Waste Water Engineering Metcalf Eddy Mc Graw Hill Publications.

2. Industrial Waste Treatment Nelson Meneroo

3. Industrial Waste Treatment Rao & Datta

Final Year B. Tech. Civil Engineering – Sem. VII

CE 4191   Design of Flyovers and Bridges (Program Elective-I)

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
2	-	--	2	ISE	20			--	--
				UT 1	15	40	40	--	--
				UT 2	15				
				ESE	50	40		--	--

Course Description:

It begins with a review of the basic concepts of structural analysis and matrix algebra, and shows how the latter provides an excellent mathematical framework for the former. This is followed by detailed descriptions, and demonstrations through many examples, of how matrix methods can be applied to linear static analysis of skeletal structures (plane and space trusses; beams and grids; plane and space frames) by the stiffness method, and also the flexibility method.

Course Outcomes:

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

1. Design superstructure and sub-structure for different types of bridges
2. Design different types of bearings for bridges
3. Design of long span bridges

Unit Wise Syllabus:

Unit 1: Design of short span Bridges   **6 hrs**

Bridge hydrology, IRC loading R.C.C. Design of slab culvert, box bridge, moment calculations

Unit 2: Design of long span bridges   **6 hrs**

Pieguads and Courbon's theory, Design of T - beam, longitudinal girders, cross beams, design of flyovers

Unit 3: Design of sub structure   **6 hrs**

Types, of piers and abutments, permissible stresses, design, adequacy of dimensions

Unit 4: Joints, Bearings and software   **6 hrs**

a) Bearings- types, forces acting, design

b) Introduction to use of software's in bridge design

160

References:

1. Victor D. J., "Essentials of Bridge Engineering", TATA McGraw Hill Publisher, Delhi.
2. Jagdish & Jayaram, "Design of Bridge Engineering", Pntrice Hall of India (P) Ltd, New Delhi.
3. Aswani, Vaziani & Ratwani, "Design of Concrete Bridge", Khanna Publishers, Delhi.
4. Raina V. K., "Concrete Bridges", TATA McGraw Hill Publisher, Delhi.
5. Dr. Punmia B. C. & Jain Arun, "Bridge Engineering", Laxmi Publications, Delhi
6. "Publications – IRC for bridges", SP-16, IS-456, IS-1343

161

Teaching Scheme				Evaluation Scheme					
					Theory (Marks)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing %		Max	Min for Passing
3	--	--	3	ISE	20	40	40	--	--
				UT 1	15				
				UT 2	15			--	--
				ESE	50	40		--	--

Course Description

This course provides an elementary introduction to probability and statistics with applications. Topics include: basic combinatorics, random variables, probability distributions, Bayesian inference, hypothesis testing, confidence intervals, and linear regression.

Course Outcomes:

After successfully completing the course, Student will able to:

1. Use statistical methodology and tools in the engineering problem-solving process.
2. Compute and interpret descriptive statistics using numerical techniques.
3. Apply the basic concepts of probability, random variables, probability distribution, and joint probability distribution.
4. Compute point estimation of parameters, explain sampling distributions, and understand the central limit theorem.
5. Construct confidence intervals on parameters for a single sample.

Unit Wise Syllabus:

Unit 1: Introduction to Statistics and Data Analysis: Overview, Role of probability and statistics in civil engineering, sampling procedures and collection of data, measures of location and variability, discrete and continuous data.   3

Unit 2: Random Events: Sample space, events, counting sample points, probability of an event, additive rules, conditional probability, multiplicative rules, Bayes' rule, Application of set theory in definition of composite event operations; Probability of events and definition of probability axioms; Solution of real life examples from civil engineering.   4

Unit 3: Random Variables and Discrete Probability Distributions: Concept of a random variable, discrete probability distributions, discrete uniform distribution, joint probability distributions, binomial and multinomial distributions, hypergeometric distribution, negative binomial and geometric distributions, Poisson distribution and the Poisson process.   6

Unit 4: Continuous Probability Distributions: Continuous uniform distributions, normal distribution and its applications, normal approximation to the binomial, gamma and exponential distributions and their applications.   6

Unit 5: Fundamental Sampling Distributions and Data Descriptions: Random sampling, 7
some important statistics, data displays and graphical methods, sampling distributions,
sampling distribution of means, sampling distribution of S^2, t-distribution, F-distribution.

Unit 6: One- sample Estimation and Tests of Hypotheses: Statistical inference, classical 10
methods of estimation, single sample: estimating the mean, standard error of a point
estimate, prediction intervals and tolerance limits, estimating a proportion and estimating
the variance

Statistical hypotheses : general concepts statistical hypotheses, testing a statistical
hypothesis, one- and two-tailed tests, tests concerning a single mean, relationship to
confidence interval estimation

Reference Books:
1. Walpole, Myers, Keying Ye Probability and Statistics for Engineers and Scientists; Pearson Education India, 8th Edition, 2008.
2. Ang, A. H-S., and Tang, W., H. "Probability concepts in engineering: Emphasis on applications in civil and environmental engineering." Wiley.
3. Kottegoda, N. T., and Rosso, R. "Applied Statistics for Civil and Environmental Engineers." Wiley.
4. Ross, S. "A first course on probability." Prentice Hall.
5. Johnson, R. A., and Gupta, C. B. "Miller and Freund's Probability and Statistics for Engineers." Pearson Education.

Final Year B. Tech. Civil Engineering Sem –VIII
CE 4521: Advanced Structural Analysis Laboratory

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing		Max	Min for Passing
--	--	2	2	ISE	--		--	100	50
				--	--			--	--
				ESE	--	--		--	--

Laboratory Work: laboratory work consist of
1) Analysis of following structures by using software. (STAAD Pro./ETAB)
a. Continuous beams
b. Beams Curved in Plan
c. Fixed Arches
d. Multistoried building frames
e. Application to beams on elastic foundation
2) Preparation of data sheets for structural analysis

Learning outcomes –

1. Achieve Knowledge of analysis and development of analytical skills

2. Understand the principles of strength of structures

3. Development of problem solving skills

4. Develop solution through software

References:

1. Vazirani & Ratwani, Analysis of Structures Vol.1, Khanna Publisher, Delhi.

2. Vazirani & Ratwani, Advanced Theory of Structures, Khanna Publisher, Delhi.

3. Timoshcnko & Gere, Theory of Elastic Stability, East West Press Ltd.

4. Gere & Weaver, Matrix Analysis of Framed Structures, CBS Publishing, Delhi.

5. Pandit & Gupta, Structural Analysis A matrix approach, Tata Mc Graw Hill, Delhi.

6. Junnarkar & Shah, Mechanics of Structures Vol. II & III, Chartor Publ. House, Delhi.

7. C.S.Rcddy, Basic structural Analysis, Tata Mc Graw Hill, Delhi.

8. Negi and Jangid, Structural Analysis, Tata Mc Graw Hill, Delhi.

Teaching Scheme	Evaluation Scheme		
Practical :2Hr./week	Practical		
	Exam.	Max.	Min.
Credits: 1	ISE	50	50
	ESE	50	50

Course Description:

Main objectives of this course/subject are to understand the structural geological problem related to civil engineering work, which helps the engineer to design the structure according to suitability of area. The subject help to prepare and analyze the data based on core logs and bore hole. As this subject is related with geology it enhance the knowledge and ideas for safe and durable structure. It also deals with part of hysrogeology for understanding groundwater and its related issues.

Course Learning Outcomes:

After completing the course, the student should be able to: -

1. Identification and extraction of subsurface data for suitability of site.
2. Calculation of strike and dip of rocks.
3. Identification groundwater potential zones.
4. Evaluation of rock quality.

Laboratory work:

Experiments

1. Structural Geological map with fold.
2. Structural Geological map with fault.
3. Strike dips problems.
4. Plotting groundwater data in Piper tri-linear diagram.
5. Plotting groundwater contours.
6. Preparation of section based on bore hole data.
7. Groundwater investigation by using resistivity method.
8. Case studies on foundation suitability.
9. Case studies on tail channel erosion.
10. Preparation of lithology amp after surveying any particular area.

References :

1   Introduction to Rock Mechanics by Verma B. P., Khanna Publisher Delhi.
2   Engineering Geology for Civil Engineers- By Dr. D. V. Reddy.
3   Geology of India and Burma – M. S. Krishnan, Higginbothams Pvt Ltd;

4   Groundwater Hydrology by Tood D. K.-John Wiley& Son. New York

5   Groundwater- C.F. Tolman. McGraw Hill Co.

6   A Text Book of Engineering Geology-By R. B. Gupte-Pune Vidyarthi Griha Prakashan, Punev)

Final Year B. Tech. Civil Engineering – Sem. VII
CE 4601 Solid and Hazardous Waste management Lab

Teaching Scheme	Evaluation Scheme		
Practical :2Hr./week	Practical		
	Exam.	Max.	Min.
Credits: 1	ISE	50	50
	ESE	50	50

Course Description:

The Laboratory serves the educational, research and development needs in the following areas: Solid and hazardous waste management systems, such as: storage, handling and treatment at the source, collection, transport, transfer, separation, materials and energy recovery, treatment and final disposal. Soil and groundwater remediation systems and restoration of brownfields contaminated by solid and hazardous waste. Monitoring and control of solid and hazardous waste facilities, as well as of facilities for the remediation of contaminated aquifers and soils. Environmental impact statements and technical-social-economic studies concerning facilities for solid and hazardous waste management, as well as facilities for soil, groundwater and brownfield remediation. Determination of physical, chemical and biological characteristics of solid and hazardous wastes. Field measurements in facilities for solid and hazardous waste management, as well as facilities for soil and groundwater remediation. Development and application of physical and mathematical models to solid and hazardous waste management facilities, as well as facilities for soil and groundwater remediation.

Course Outcomes:

Student will be able to

1. Determine solid waste quantity for SWM.
2. Analyze Hazardous waste from Industry
3. Calorific analysis of Waste and Evaluate various properties of solid waste.
4. Construct layout for sanitary landfill site and composting site.
5. Suggest sustainable and economical solution for Hazardous Waste.

Laboratory work:
Experiments

Part A
1   Assignment on each unit

Part B

1   Analysis of solid waste- Physical and Chemical
2   Study of waste generation and sources
3   Study on classification all types of wastes

4	Study of identification and characterization of wastes

4   Study of identification and characterization of wastes

5   Collection of data with detail investigation on system of solid waste management and analysis of the system

6   Preparation of report of a city solid waste management system including positive points and lacuna in the present system

7   Study of hazardous waste producing industry with details of points of generation in various forms.

8   Study of manifestation system of particular hazardous waste with processes including handling, storage, transportation and disposal

9   Study on treatment technology of hazardous waste Two TO Three minimum.

10   Study of relevant standards on hazardous waste generation, storage ,

11   Visit report preparation of a hazardous waste case

12   Project on Design of Refuse collection & Disposal System for medium size town/ part of city.

References

1. Solid Waste Management – Dr. A. D. Bhide, Published by Indian National Scientific Documentation Centre, New Delhi.

2. Solid Waste Management – Gorge Tchobanoglous, Published by McGRAW-HILL: New York 2nd Edition.

3. Solid Waste Management Hand Book – Pavoni, Published by A Willy – Interscience Publication ISBN- 047187711-5

4. Composting – Gottas, Published by World Health Organisation, Geneva,1956.

5. Manual on Municipal Solid Waste Management by Ministry of Urban Development of Govt. of India.

6. Environmental Engineering –By Peavy & Rowe, Published by New York : McGraw-Hill

Teaching Scheme	Evaluation Scheme		
Practical :2Hr./week	Practical		
	Exam.	Max.	Min.
Credits: 1	ISE	50	50
	ESE	50	50

Course Description:

This subject is intended to make students aware about various types of treatment methods with their basic design aspects and safe disposal & management of solid and bio solid generated after treatments of liquid waste.

Course Outcomes:

Student will be able to

1) Proper understanding about designing aspects of unit & process design treatment plant
2) Basis knowledge about treatment through chemical & biological process
3) Hands on experience on sampling and measurements of wastewater parameters

Laboratory work:
Experiments

1. Intoduction to liquid effluent treatment lab
2. To determine the MLSS (Mixed liquor suspended solids) of given wastewater sample.
3. To determine the MLVSS (Mixed liquor volatile suspended solids) of given wastewater sample.
4. To determine Total Kjeldahl Nitrogen (TKN) in wastewater sample
5. Determination of Dissolve Oxygen of wastewater sample
6. Determination of the BOD in given wastewater sample
7. Determination of COD of given wastewater sample
8. Determination of Turbidity in a given sample.
9. Determination of Optimum dose of coagulant
10. Determination of volatile organic compound in a given sample.

References:

1 Peavey, H. S. Rowe, D.R., Environmental Engineering, McGraw-Hill Book Company 1985.
2 P. N. Modi, Waste water Engineering,. Standard Book House, New Delhi. 2011,Third Edition
3 Viessman W. and Hammer M.J. Water supply and pollution Control, Harper Collins College publishers 1993 Sixth Edition..
4 Hammer M.J. Water and Waste water Technology, Prentice-Hall of India Private Limited.1995 Second Edition.
5 G. S. Birdie ,Water Supply & Sanitary Engineering, , Dhanpat Rai & Sons, New Delhi 2014.
6 Manual on sewerage and sewage Treatment Government of India Publication.2008.

7 G. M. Master Introduction to Environmental Engineering & Sciences Pearson Education 2007 Second edition.
8 Metcalf and Eddy ., Wastewater Engineering treatment and Disposal. Tata Mcgraw-hill publication, New Delhi Third Edition 2003

CE4581: ADVANCED STRUCTURAL DESIGN LAB

Teaching Scheme				Evaluation Scheme					
					Theory (Marks %)			Practical (Marks %)	
L	T	P	Credits	Scheme	Max	Min for Passing	Max	Min for Passing	
--	--	2	1	ISE	--	--	--	50	50
				ESE	--	--	--	50	50

COURSE DESCRIPTION

This course deals with design of special structures with respect to buildings, such as flat slab, retaining wall, overhead water tanks, foundation using any standard software.

COURSE LEARNING OUTCOMES

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

1. Analyze and design the structures such as flat slab, retaining wall, overhead water tanks, foundation using software.
2. Sketch the detailing of the reinforcement
3. Demonstrate working in teams.

LABORATORY WORK

Laboratory work shall consists of analysis and design of following structure using standard software and drawing of reinforcement detailing.

1. Flat slab

2. Retaining wall

3. Overhead water tank

4. Foundation: Raft foundation and combined footing.

REFERENCES:

1. Sinha and Roy - Fundamentals of Reinforced Concrete, 3rd Edition, S. Chand and Company Ltd. New Delhi
2. A. K. Jain - Reinforced Concrete Design
3. Karve and Shah - Limit State Theory and Design, Structures Publications, Pune
4. P. C. Varghese - Limit State Design of Reinforced Concrete, 2nd Edition, Prentice Hall of India, New Delhi
5. IS: 456-2000
6. IS:3370- 1 to 4- Code of Practice for concrete structures for the storage of liquids.

7. N. Unnikrishna Pillai/ Devdas Menon - Reinforced Concrete Design, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi

8. N. Krishna Raju - Advanced Reinforced Concrete Design, 2nd Edition, CBS Publishers Distributors Pvt. Ltd.

9. Chu-Kai Wang, Charles G. Salmon - Reinforced Concrete Design, 4th Edition, Harper International Edition

10. S. K. Mallick, A. P. Gupta - Reinforced Concrete, 2nd Edition, Oxford & IBH Publishing Company, Mumbai

11. P. Purushothaman - Reinforced Concrete Structural Elements, Tata McGraw- Hill Publishing Company Limited, New Delhi

12. Ferguson, Breen, Jivsa - Reinforced Concrete Fundamentals, 5th Edition, John Wiley & Sons, New York

13. T. S. MacGinley & B. S. Choo - Reinforced Concrete, 2nd Edition, E. & F. N. Spon, London

14. P. C. Varghese - Advanced Reinforced Concrete Design, 2nd Edition, Prentice- Hall of India, New Delhi

172

Final Year B. Tech. Civil Engineering – Sem. VII
Advanced Foundation Engineering Laboratory

Teaching Scheme	Evaluation Scheme		
Practical :2Hr./week	Practical		
	Exam.	Max.	Min.
Credits: 1	ISE	50	50
	ESE	50	50

Course Description:

Main objectives of this course/subject are to understand and design the basic infrastructural facilities like foundation, earth retaining structure and embankments. In this course the civil engineer has many diverse and important encounters with soil. Soil mechanics is a branch of soil physics and engineering mechanics that describes the behavior of soils.

Course Learning Outcomes:

After completing the course, the student should be able to: -

1. Identification and extraction of disturbed and undisturbed soil sample.
2. Calculation of bearing capacity of soil using different testing methods of different soil.
3. Identification of swelling shrinkage nature of soil.
4. Evaluation of field permeability of soil.

Laboratory work:

Experiments

1. Preliminary investigation of soil on site.
2. Extraction of disturbed and undisturbed soil from site.
3. Onsite moisture calculation
4. Standard penetration test
5. Plate load test cohesionless soil.
6. Plate load test cohesive soil.
7. Vane shear test
8. Field permeability test
9. Swell test.
10. CBR test

References :

1. Lambe T.W., "Soil Testing for Engineers",Wiley Eastern Ltd.New Delhi.
2. Head K.H, "Manual of Soil Laboratory Testing"Princeton Press, - Vol. I, II, III, London(1986).
3. Bowles J.E., "Engineering Properties of Soil and Their Measurements McGraw Hill Book Co. New York(1988).

4. BIS Codes of Practice: IS 2720(Part-3/Sec. 1) 1987; IS 2720 (Part 2) -1973; IS 2720 (Part 4) 1985; IS 2720 (Part 5) 1985; IS 2720 (Part 6) 1972; IS 2720 (Part 7) 1980; IS 2720 (Part 8) 1983; IS 2720 (Part 17) 1986; IS 2720 (Part - 10) 1973; IS 2720 (Part 13) 1986; IS2720 (Part 11) 1971; IS2720 (Part 15) 1986; IS 2720 (Part 30) 1987; IS 2720 (Part 14) 1977; IS 2720 (Part 14) 1983; IS 2720 (Part 28) 1974; IS 2720 (Part 29) 1966, IS 2720 (Part-60) 1965.

CE 4661: Geo-informatics for Engineering Lab

Teaching Scheme	Evaluation Scheme		
Practical :2Hr./week	Practical		
	Exam.	Max.	Min.
Credits: 1	ISE	50	50
	ESE	50	50

Course Description:

Main objectives of this course/subject are to understand the various applications of QGIS for Civil Engineering. It manly deals with processing data and interpretation results based on it. In Civil engineering works there are many functions where the GIS software plays important role for fastest coverage and accurate analysis of works like surveying for road and water resources. With this it is possible to represent the huge data in very short period of time.

Course Learning Outcomes:

After completing the course, the student should be able to: -

1. Identification and extraction contour data based.
2. Calculation of slope and aspect features of area.
3. Identification of linear features of area.
4. Evaluation of water shade data.

Laboratory work:

Experiments

1. Introduction to QGIS interface.
2. Georeferancing the map.
3. Plotting Excel data in QGIS.
4. Plotting GPS data in QGIS.
5. Google interaction in QGIS.
6. Slope map and slope calculation.
7. Field survey using GPS for creating contours.
8. Project on watershed delineation.
9. Use of SWAT tool in QGIS.
10. Proximity and overlay analysis.

References:

1. T.M. Lillesand and R.W. Kiefer, Remote Sensing and Image Interpretation -, John Wiley & Sons, Singapore, 5th Edition, 2004.
2. Satheesh Gopi, R. Sathishkumar, Advanced Surveying-Total Station, GIS and Remote sensing-, Pearson publication, 2nd Edition, 2008.
3. Kang Tsung Chan, Geographic Information System, Tata McGraw Hill, 4th Edition, 2007.

Total Credits

Sr. No.	Batch	Sem. I		Sem. II		Year wise	
		Hr.	Credits	Hr.	Credits	Hr.	Credits
1	F Y B Tech	30	**23**	30	**23**	60	**46**
2	S. Y. B Tech	30	**22**	29	**25**	59	**47**
3	T. Y. B Tech	27	**22**	30	**25**	57	**47**
4	Final Year	30	**28**	24	**24**	54	**52**
	Total Credits						**192**

K. E. Society's

Rajarambapu Institute of Technology, Sakharale

Option II

Industry Internship and Project

Sr. No.	Course Code	Course Title	Contact Hours			Credits	Scheme	Theory weightage		Practical weightage	
			L	T	P			Max	Min for passing (%)	Max	Min for passing (%)
1	IIP480X	Self Study /Online Course related to project domain area approved by DPC	-	-	-	2	ISE	-	-	100	50
2	IIP4801	Internship	-	-	-	10	ISE			50	50
							ESE			50	50
3	IIP4802	Project (Individual related to their Specialization)	-	-	-	12	ISE			50	50
							ESE			50	50
Total						24					

Contact Hours: Students are required to spend 20 weeks as per the company timing.

No of Credits: 24

The evaluation will be done jointly by industry and institute faculty. ESE for project is examined by host industry and institute faculty

K. E. Society's
Rajarambapu Institute of Technology, Sakharale
B. Tech Semester VIII
Option II
Industry Internship and Project

RIT in its autonomy model place high focus on the interaction with industries to them adequate exposure to the practicing aspect of theoretical knowledge they learn in classroom. Moving a step ahead, from the academic year 2017-18 in order to enhance the students experience with world work, we are in the process to introducing industry internships after a through consultation with industry persons, academicians as a part of the major curricular reforms in the choice based credit system (CBCS). This internship program is designed into stages.

Option III : Industry Internship and Project	
Self Study/ Online Certification Courses in the project domain area, approved by the DPC	2 Credits
Internship	10 Credits
Project (Individual related to technology)	12 Credits
Total Credits 24. The evaluation will be done jointly by industry and institute faculty. ESE for project is examined by host industry, and institute faculty	

K. E. Society's

Rajarambapu Institute of Technology, Sakharale

Option II

Industry Internship and Project

Industry Internship Program (IIP II) and Project Choice Based for students at Semester VIII for full semester (20 weeks)

This course aims at brining students to the world of work which imbibes in them the skills and competencies required to make them professionals as per the expectation of the industry it is a semester long (20 Weeks) course where the students are expected to work as interns and carry out the individual projects assigned to them by the company. The students learning progress is monitored by both industry person concerned and the institutional coordinator

The Internship Phase II has two components

1. An internship training
2. Project Assignment

Criteria of selection of students

The students who want to opt for industry internship II and project with are required to fulfill the criteria specified

1. CPI of students up to semester VI should be ≥ 6.75 (with no backlogs)
2. Ready to move to the place where industry assignment is allotted.
3. The entire cost of the Internship will be borne by the students (lodging boarding and any other cost).
4. The students have to go through the selection process of the company.
5. Maximum number of students will be decided based on the policy guidelines prepared from time to time.

6. Once the student is allotted the company (after final selection process) cannot be changed and it is binding on the student to complete the assignment in that company.

Criteria for listing of the companies

1. It should be a medium or large scale industry having the functional departments and facilities to design develop and manufacture the products or offer services and potential to recruit engineers after training.

2. Company should provide minimum 2-3 internship assignments and projects and extend facilities to students the learning as well as access to data & information and guidance to complete the assigned project.

3. Should be able to keep record of attendance and provide a mentor to monitor the project and help the students to sort out problem issues.

Project Assignment

A student doing internship in the company is required to carry out an individual project in the domain specific area with help of company mentor ,Guide and faculty coordinator assigned for which qualifies for the credits mentioned in structure and also required to undergo self study or choice course.

The project proposal is to be prepared and get approved by the DPC of the department student is required select the problem for solution which requires data Collection, analysis and implementation of the solution. (It is not a just company Internship Report)

Industry Internship and Project Monitoring

A team of faculty members from the institute assigned will monitor closely the progress of training and project and helps to sort out any issues concerned.

Outcome expected at the end of internship

1. Understand the functioning of the company in the terms of inputs, transformation process and the outputs (products and services)
2. Learn to adjust with the company culture, work norms, code of conduct.
3. Understand and follow the safety norms, Code of conduct.
4. Learn to observe, analyze and document the details as per the industry practices.
5. Understand the processes, systems and procedures and to relate to the theoretical concepts- studies.

Projects

After the successful completion of the project the student should be able to

1. Identify the project/problem in the domain of program relevant to the company.
2. Collect the information to the pertaining to the problem identified.
3. Analyze the information using the statistical tools/ techniques.
4. Suggest the feasible alternative solution and select the best solution.
5. Present the solution to the company and seek assistance in the implementation.
6. Measure the impact of the project on the performance of company/department/section.

Internship Monitoring

Each student is assigned a faculty mentor by the institute who monitors the progress of both the internship and project and helps the student to sort-out any issues/ problems arising. The faculty is scheduled to make three visits during the internship

1.	At the beginning of the program	First week of program
2.	Mid of the program (to review program)	After 10 weeks
3.	At the end of the internship	For evaluation

Note: Apart from these three scheduled visits, the faculty on request of students/company will visit in case of any issue related to the internship project.

Work Diary

Each student is provided with a diary which contains details regarding internship, do's and don'ts and evaluation scheme. Students is required to write the dairy regularly and get it signed by the industry guide periodically during the visit the faculty assigned to the student should be able to go through the dairy to access the work done and write the remarks/ instruction. At the end of the internship, the duly completed dairy to be submitted to the department.

Evaluation of Internship: (10 credits)

The assessment of the internship will be done jointly by the industry and the faculty assigned to the students. The tentative scheme of assessment will be

1.	Punctuality, behavior and following code of conduct (to be assessed by the company personal)	20%
2.	Initiative, observation and interest in learning new things (faculty in charge)	20%
3.	Familiarization with specific Department/shop/function assigned to student (to be assessed by the company personal)	10%
4.	Final evaluation based on presentation of work, internship report (jointly by the company personnel and examiner appointed by institute & faculty guide)	50%

Minimum 50% is mandatory for successful completion of internship or else the extension will be given to make the student to come up to the expectation

Evaluation of the project (12 Credits)

1.	Project/Problem identification and preparation of project proposal approved by both the company and faculty endorsed by the DPC	20%
2.	Mid review of the project as per schedule specified jointly by company and faculty assign	30%
3.	Final examination of the project along with detailed project report (industry person + Faculty guide + External examiner, Either at institute/company required)	50%

The student is required to complete both internship and project successfully to become eligible for award of the degree.

Semester-VIII

Teaching and Evaluation Scheme

Sr. No.	Course Code	Course Title	Contact Hours			Credits	Evaluation Scheme					
			L	T	P		Scheme	Theory (Marks %)		Practical (Marks%)		
								Max	Min for passing	Max	Min for passing	
1.	REM4001	Research Methodology	3	0	2	4	ISE	20		40	-	-
							UT1	15				
							UT2	15				
							ESE	50	40			
2.	RE1-------	Research Elective I	3	1	0	4	ISE	20		40	-	-
							UT1	15				
							UT2	15				
							ESE	50	40			
3.	RE2-------	Research Elective II	2	0	0	2	Online	100		40	-	-
4.	REL-------	Research Laboratory (Elective I)	0	0	4	2	ISE	-	-	-	50	50
							ESE	-			50	50
5.	REPRJ--	Research Project	0	0	12	12	ISE	-	-	-	50	50
							ESE	-	-		50	50
	Total		08	01	18	24						

Teaching Scheme				Evaluation Scheme				
L	T	P	Credits	Scheme	Theory Marks		Practical Marks	
					Max.	Min. for Passing	Max.	Min. for Passing
-	-	2	1	ISE	50		50	50
				ESE	50		50	50

Any undergraduate student interested in pursuing M.S. or Ph.D in foreign universities or reputed institutes in India can select option of Undergraduate Research Experience (URE) module. This module helps students acquire skills for undertaking research work.

Undergraduate research work is an inquiry, investigation, or creation produced by an undergraduate student that makes an original contribution to the discipline and reaches beyond the traditional curriculum. Undergraduate research experience is designed to provide students with the opportunity to develop and practice advanced discipline-specific projects in collaboration with faculty members.

This Course is pre-requisite for students who have opted Under Graduate Research Experience (URE) in semester VIII of the B. Tech program.

The course outcomes mainly focus on writing review paper and preparing synopsis of research work to be done in Semester VIII of the B. Tech program.

OUTCOMES

After successful completion of URE phase I, student will be able to:

1. Perform literature review and identify research topic.
2. Write synopsis of the research work that being done in semester VIII.
3. Write technical review paper.

Methodology

1. Students should finalize the research area and research topic in consultation with the research advisor.
2. Students should collect the relevant literature pertaining to the topic to understand what is the current level of research/work being done in this area. Read and understand the topic in all its dimensions and make a note of what is being done.
3. Prepare the report of literature review and gap analysis by referring to various published work in National, International Journals, Papers and Thesis or Projects. It is expected that students should refer minimum 15 latest technical papers, related to research topic. However if less number of references are available due to new research topic then reason for less number of references must be mentioned in synopsis.

1

4. Prepare the synopsis of proposed research work that is being done in semester VIII and divide the work into 4-5 important time bound phases.
5. Make a preparation for experimentation, or any study visit to be made to get further details or to work for experimentation/lab facility in some research organizations etc.
6. It is responsibility of student and research advisor to ensure that required lab facility is either available in institute or made available in other institute/industry before finalizing research topic.
7. Fine tune the synopsis and present it to the evaluation committee (DPC) of department and get it approved for implementation in semester VIII.
8. Write one review paper on literature review, so as to get the exposure to the process of technical paper writing. Review paper must be submitted to suitable journal on or before 3^{0th} November.
9. Student is required to report his/her research advisor every week and brief about the work done for that week. Maintain separate diary for this purpose.
10. Finalize Research Elective-I, Research Elective-II and Research Laboratory (Elective-I) and must be declared in synopsis presentation.

Assessment

Assessment of progress by a supervisor and team appointed by the HOD of the respective department.

1. In semester evaluation (ISE) is to be done by supervisor based on interaction with student and activities completed by student.
2. End of the semester evaluation on all aspects (Scheduled before the end of term dates as notified by DPC/as per academic calendar). Student is expected to give synopsis presentation.
3. A Synopsis report in prescribed format to be submitted for evaluation.
4. Review paper must be submitted to suitable journal before commencement of semester VIII.

Undergraduate Research Experience

Any undergraduate student interested in pursuing M.S. or Ph.D in foreign universities or reputed institutes in India can select option of Undergraduate Research Experience (URE) module. This module helps students acquire skills for undertaking research work.

Undergraduate research work is an inquiry, investigation, or creation produced by an undergraduate student that makes an original contribution to the discipline and reaches beyond the traditional curriculum. Undergraduate research experience is designed to provide students with the opportunity to develop and practice advanced discipline-specific projects in collaboration with faculty members.

Pre-Requisite: Students opting URE module should have CPI>=7.0

Option II : Undergraduate Research Experience (URE)	
Research Methodology	3-0-2-4
Research Elective I	3-1-0-4
Research Elective II	2-0-0-2
(Self Study/Online//certification /NPTEL course approved by BOS)	
Research laboratory (Elective I)	0-0-4-2
Research Project	0-0-12-12
Total Number of credits 24 for semester VIII (Common to all B. Tech Programs)	

Semester-VIII

Teaching and Evaluation Scheme

Sr. No.	Course Code	Course Title	Contact Hours L	T	P	Credits	Scheme	Theory (Marks %) Max	Min for passing	Practical (Marks%) Max	Min for passing
1.	REM4001	Research Methodology	3	0	2	4	ISE	20		-	-
							UT1	15	40		
							UT2	15			
							ESE	50	40		
2.	RE1-------	Research Elective I	3	1	0	4	ISE	20		-	-
							UT1	15	40		
							UT2	15			
							ESE	50	40		
3.	RE2-------	Research Elective II	2	0	0	2	Online	100	40	-	-
4.	REL-------	Research Laboratory (Elective I)	0	0	4	2	ISE	-	-	50	50
							ESE	-		50	50
5.	REPRJ--	Research Project	0	0	12	12	ISE	-	-	50	50
							ESE	-	-	50	50
Total			**08**	**01**	**18**	**24**					

B.Tech Semester VIII
URE Phase II

REM4001: Research Methodology

Teaching Scheme				Evaluation Scheme						
L	T	P	Credits	Scheme	Theory (Marks %)				Practical (Marks %)	
					Max	Min for Passing			Max	Min for Passing
3	-	2	4						--	--
				ISE	50		50%		--	--
				ESE	50				--	--
									--	--

course

Corse Description:-

This course is designed to help students develop the research skills required to competently undertake and complete research projects. It will provide students with the training required to develop the skills to review and critically analyze literature on topics related to their research projects, justify the rationale for research, develop effective research designs for their projects, understand the role of theories in research, and learn to write research proposals. Students will acquire skills in both qualitative and quantitative research techniques and learn to report research findings (empirical work) with implications and draw conclusions.

Prerequisites: -

Basic knowledge of statistics.

Course Outcomes:-

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

1. Select on the literature in the field, analyze and interpret research evidence published on a topic to establish a suitable research problem/issue or opportunity to explore further;
2. Design the research study using a suitable paradigm, associated methodologies and methods of data collection and analysis.
3. Write a research proposal (research blueprint) describing the topic.
4. Demonstrate the ability to use the statistical software to solve problems.

REM4001:Research Methodology

Syllabus

Unit No.	Detail Content	Hrs.
1	**Overview of research** Definition of research and characteristics of research; Types of research; A group discussion on what is research	3
2	**Literature survey** Importance of literature review, types of literature review, selection of the review topic, searching for the literature, analyzing and synthesizing the literature, writing the review report.	6
3	**Data Analysis using Statistical tools for analysis** Analysis of variance, regression analysis, Response surface methods for process optimization, SPSS/MINITAB software, modeling skills.	7
4	Creativity in Research, report preparation with Latex and white smoke, Group discussion on Ethics in Research, Plagiarism check.	5
5	**Design of experiments** Strategy of experimentation, Statistical design of experiments, replication, randomization and blocking. Guidelines for designing experiments, Factorial designs. Factorial designs. The two factor factorial design, Statistical analysis of factorial design, Taguchi design.	8
6	**Intellectual Property** Introduction to IPR; Overview & Importance; IPR in India and IPR abroad; Patents ;their definition; granting; infringement ;searching & filing; Utility Models an introduction; Copyrights ; their definition; granting; infringement ;searching & filing, Trademarks ,role in commerce ,importance , protection, registration; domain names;Department specific research discussions	7

Text Book: Kothari C.K. (2004) 2/e, Research Methodoloy – Methods and Techniques (New Age International, New Delhi).

References:

1. Krishnswamy, K.N., Shivkumar, Appa Iyer and Mathiranjan M. (2006) Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)
2. Gupta, Santosh (2005) Research Methodology and Statistical Techniques, Deep and Deep Publications.
3. Douglas C. Montgomery, Design and analysis of experiments, John Willey and Sons, New York.

4. Tapan Bagchi, Taguchi Methods Explained: Practical steps to robust design, Prentice Hall.
5. Phillip J. Ross, Taguchi Techniques for quality engineering, TATA McGraw Hill
6. Ajit Parulekar and Sarita D' Souza, Indian Patents Law – Legal & Business Implications; Macmillan India ltd , 2006
7. P. Narayanan; Law of Copyright and Industrial Designs; Eastern law House, Delhi , 2010

B.Tech Semester VIII
URE Phase II

Research Elective I Course Code : _____

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks)			Practical (Marks)	
					Max.	Min. for Passing		Max.	Min. for Passing
3	1	0	4	ISE	20			--	--
				UT1	15		40		
				UT2	15			--	--
				ESE	50	40		--	--

Students enrolled in Undergraduate Research Experience Module must select a course at UG or PG level which is relevant to his/her research project. The selected course preferably should have lab course associated with it. Examination scheme of the course and evaluation will be done as per RR of the institute. In case if relevant course is not offered in the department then research advisor is required to design the course content.

Course Objective: After completion of Research Elective I student should be able to

1. develop fundamental knowledge required to pursue selected research project.

Guidelines/Criteria for selecting Research Elective I:

1. Student must finalize research advisor in the VII semester of UG program.
2. Research project area must be identified in the VII semester.
3. Based on research project area identified, student must decide Research Elective I course in consultation with research advisor.
4. Research elective I course selected by students must be related to area of research project.
5. If course offered at PG level has less no of credits then credits will be matched to 4.

B.Tech Semester VIII
URE Phase II

Research Elective II Course Code : _____

(Self Study/Online//certification /NPTEL course approved by BOS)

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks)			Practical (Marks)	
					Max.	Min. for Passing		Max.	Min. for Passing
								--	--
2	0	0	2	Online	100		40		
								--	--
								--	--

Students enrolled in Undergraduate Research Experience Module must select a Research Elective II course. Research elective II course will not be floated by any department. This course can be Self Study/Online/certification /NPTEL course approved by BOS (Board of studies). If it is self study type course then research advisor is responsible for defining syllabus and assessment of the course.

Course Objective: After completion of Research Elective II student should be able to

1. gain the useful knowledge required to pursue selected research project.

Guidelines/Criteria for selecting Research Elective II:

1. Student must finalize research advisor in the VII semester of UG program.
2. Research project area must be identified in the VII semester.
3. Based on research project area identified, student must decide Research Elective II course in consultation with research advisor.
4. Research elective II course will not be floated by any department. This course can be Online/certification /NPTEL/Blended MOOCS IIT Powai/Swayam courses etc approved by BOS (Board of studies). The selected online course should preferably have gradation type of evaluation. In case if grade certificate is not available for selected online course then student need to submit brief report about the course studied not exceeding 20 pages. Further student need to make presentation before DPC committee.
5. Research advisor must see that there is proper assessment scheme adopted and grades are awarded on completion of course.
6. Research advisor must monitor progress of the student in the Research Elective II and take corrective action if required.
7. Student has to pay the fees of online course if applicable.

Assessment

1. If grade certificated is issued to student then additional examination/evaluation by department is not needed.

2. In case if grade certificate is not available for selected online course then student need to submit brief report about the course studied not exceeding 20 pages. Further student need to make presentation before DPC committee. Research Supervisor and DPC will do joint evaluation for grading purpose.

URE Phase II

Research Laboratory (Elective I) Course Code : _____

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks)		Practical (Marks)	
					Max.	Min. for Passing	Max.	Min. for Passing
0	0	4	2	ISE			50	50
				ESE			50	50

Research Laboratory is related to Research Elective I. Examination scheme of the course and evaluation will be done as per RR of the institute. Student must opt Research Elective –I course which has laboratory course associated with it. In case if relevant lab course is not available to the Research Elective I, then research advisor shall assign practical work in line with research area. Type of this work may be testing, analysis, measurement etc.

Course Objective: After completion of Research Laboratory (Elective I) student should be able to

1. Gain the practical knowledge required to pursue selected research project.

2. Assessment:

ISE: Evaluation is to be done based on regular work done and performance.

ESE

1. ESE must be conducted jointly by research advisor and one DPC member.
2. A Lab report on the activity is to be prepared and submitted for evaluation.

URE Phase II

Research Project Course Code : _____

Teaching Scheme				Evaluation Scheme					
L	T	P	Credits	Scheme	Theory (Marks)			Practical (Marks)	
					Max.	Min. for Passing		Max.	Min. for Passing
0	0	12	12	ISE				50	50
				ESE				50	50

Research Project course aims to develop research skills in UG students. The acquired skills shall be useful to pursue higher level research at M. Tech/M. S or Ph. D level. This course may also help students to get admission in reputed foreign universities for M.S. program as research project completed at UG is one of the selection criterions.

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

1. Search the technical literature.
2. understand and critically evaluate theories, practices, and/or research on a chosen topic by conducting a thorough literature review and submitting a written integrative, critical summary of the current literature.
3. approach a research problem and develop a methodology.
4. perform searches for relevant information.
5. develop and implement an advanced original research or creative project.
6. develop the ability to explain the conceptual viability of the project and describe the major components involved.
7. develop the ability to explain how the project will impact the relevant body of work.
8. develop advanced discipline-relevant skills and competencies.
9. properly keep an accurate record of research performed.
10. write a research report and technical paper.

Guidelines

1. Students opting URE module must finalize research advisor, area of research and research project in VII semester of UG program.

2. Credit Hours: Students are expected to devote 12 hours a week in research project. Students can enroll in a total of 12 credit hours of this course. Students should carefully discuss with their research advisor the time expectations for completion of the requirements research project.

2. Assessment:

ISE

Research advisor is encouraged to strongly consider the following grading rubric:

Degree to which students meet expectations. Expectations are to be established by the research advisor and student a minimum of one semester in advance of the student's enrollment in the research course. The following is a minimum set of expectations for every student enrolled in this course for credit: i.) perform a background literature search and review, ii.) develop a project plan, iii.) perform experimental work or applied experimental work, iv.) write and present a research report. All four of these minimum expectations as well as additional expectations (e.g., attendance at departmental and/or College, research seminars, participation in research group meetings, etc.) are to be clearly established and articulated to the student by the research advisor prior to commencement of the research project.

Quality of the final report and oral presentation. The research advisor will provide clear expectations of the desired format, content, and deadlines of the final report. The research advisors and DPC will jointly grade the final report.

Attendance.

In order to provide the students a measure of performance, the research advisor is expected to complete a mid-term evaluation of the student, accompanied by recommendations for improvement for the remainder of the term. The mid-term evaluation of the student should be accompanied by a one-on-one meeting between the research advisor and the student. Student is required to report his/her research advisor every week and brief about the work done for that week. Maintain separate diary for that purpose.

Absences and Make-up Work: Requirements for attendance is as per RR of institute

ESE

3. End of the semester evaluation on all aspects (Scheduled before the end of term dates as notified by DPC)
4. A project report on the activity in prescribed format is to be submitted for evaluation.
5. A technical paper based on research work must be submitted on or before ESE to suitable journal.

11

K. E. Society's
Rajarambapu Institute of Technology, Sakharale
B. Tech Semester VIII
Option IV : Entrepreneurship Development

Sr. No.	Course Code	Course Title	Contact Hours			Credits	Evaluation Scheme					
								Theory weightage			Practical weightage	
			L	T	P		Scheme	Max	Min for passing (%)		Max	Min for passing (%)
1	ED 4002	Project Feasibility Analysis	3	-	-	3	ISE	20	40	50		
							UT1	15				
							UT2	15				
							ESE	50	40			
2	ED 4004	Finance for Entrepreneur	2	-	-	2	ISE	20	40	50		
							UT1	15				
							UT2	15				
							ESE	50	40			
3	ED 4006	Marketing for Entrepreneur	2	-	-	2	ISE	20	40	50		
							UT1	15				
							UT2	15				
							ESE	50	40			
4	ED 4008	ED Lab.	-	-	4	2	ISE				100	50
5	ED 4010	Product/Start up Complete techno economic feasibility assessed by funding agencies and approved for funding	0	0	12	12	ISE				50	50
							ESE				50	50
6	ED 4012	EDP Program (short term Intensive Program either in house/by any authorized agencies approved by CIIED)	-	-	-	3	ISE				100	50
Total			7	0	16	24						

Contact Hours:

No of Credits: 24

Option IV : Entrepreneurship Development	
Sem.VII	
ED 4001 – Business Opportunities Guidance	**0-0-2-1**

Sem.VIII	
ED 4002 - Project Feasibility Analysis	**3-0-0-3**
ED 4004 - Finance for Entrepreneur	**2-0-0-2**
ED 4006 - Marketing for Entrepreneur	**2-0-0-2**
ED 4008 - ED Lab.	**0-0-4-2**
ED 4010 - Product/Start up Complete techno economic feasibility assessed by funding agencies and approved for funding	**0-0-12-12**
ED 4012 - EDP Program (short term Intensive Program either in house/by any authorized agencies approved by CIIED)	**0-0-0-3**

Semester VII- It is expected that student should generate, analyze, Identify proper business opportunity with SWOT analysis with systematic framework. Prefeasibility report will be prepared.

Semester VIII- For entire semester student will work on his selected business idea to convert it in viable commercial project. Necessary inputs will be given to student. At end of semester student should prepare Project report with detailed market survey, technical appraisal, commercial appraisal & financial appraisal .This project report should be approved by loan appraisal officers of bank.

Class- Final Year **B. Tech** Semester-**VII**		L	T	P	Credits
Course Code : ED 4001	Course Name : **Business Opportunity Guidance.**	-	-	2	1

Course description :

Identifying the right business opportunity is important for the success of any new entrepreneurial venture. Budding entrepreneurs should be able to identify suitable business opportunities at the right time and in the right way. This course aims to help students identify business opportunities effectively and get hands on experience in applying creativity and understanding in problem identification and solving.

Course Learning Outcomes:

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

    CO_ED4001_1. Generate & Identify different business ideas.

    CO_ED4001_2. Make analysis of different ideas.

    CO_ED4001_3. Select proper business idea to suit his personality & competencies.

    CO_ED4001_4. Prepare pre feasibility analysis.

Practical No.	Description
1	Introduction to Course
2	Entrepreneurial motivation
3	Understanding the market: identifying ideas and areas with business potential, analyzing the needs and wants of the market, identifying resource needs. Identifying where business opportunities can lie and in what form. Identifying potential customer / user benefits and benefits to society as a whole.
4	Identifying the Opportunity: Convergent and divergent approach of opportunity sensing. Transforming ideas into reality, realities of setting up new ventures,
5	Screening opportunities, devising the business plan, the family as a source of entrepreneurial support. Deciding the scope of the opportunity and gains from it
6	Analyzing Business Opportunities: Market Analysis; demand-supply. Technical Analysis; assets analysis, Financial Analysis; sources of capital and its cost. Viable and feasible business Opportunity: Testing feasibility of business idea.
7	Independent student work on his own Idea.
8	Independent student work on his own Idea.
9	Independent student work on his own Idea.
10	Independent student work on his own Idea.
11	Idea Presentation & evaluation
12	Idea Presentation & evaluation

Student should report to his mentor every week.

ISE evaluation-

1. 25 % Marks – For consistent efforts taken by students to develop realistic business model.(mentor)

2. 75% Marks - At the end of semester, student will prepare & present report on selected final Business Idea with prefeasibility study, analysis & justification before expert Committee. Committee will consist of Head CIIED, competent faculty, entrepreneurs & outside experts.

Textbook:

Timmons, J.A. and Spinelli, S.: New Venture Creation – Entrepreneurship for the 21st century. McGraw Hill

References:

1. Holt, D.H., Entrepreneurship – New Value Creation, Pearson
2. Roy. R., Entrepreneurship, Oxford
3. EDP resource material by EDI, Ahmedabad.
4. EDP resource material by MITCON.

Class- Final Year **B. Tech** Semester-VIII		L	T	P	Credits
Course Code : ED 4004	Course : **Finance for Entrepreneurs.**	2		--	2

Course description-

To familiarize students with accounting, mechanics of preparation of financial statements, understanding corporate financial statements, their analysis and interpretation.

The objectives of the course are to build the skills, frameworks and knowledge in entrepreneurial finance. Students will study the financing of small and medium sized businesses from the perspective of both the entrepreneur and investors. They will learn how the financing decisions of small and medium sized private companies differ from those of public firms. They will also see how the use of real options and milestones relate to the strategy and the value on an opportunity.

Course Learning Outcomes:

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

CO_ED4004_1. Understand basic Financial Terminologies.

CO_ED4004_2. Prepare & analyze financial statements.

CO_ED4004_3. Prepare financial Plan for venture.

CO_ED4004_4. Make & analyze investment decisions.

CO_ED4004_5. Calculate working capital requirement.

Prerequisite: General knowledge of economics & clear concept about own business model.

Course Content		
Unit No.	**Description**	**Hrs.**
1.	**Accounting Terminologies:** meaning, nature, functions, types of accounting; basics of financial statements, generally accepted accounting concepts, principles and conventions; double entry system. Accounting Records: Fundamentals of record keeping, the accounting process, transactional analysis, the Adjusting and Closing process. Accounting systems. Computer-based accounting systems. Accounting cycle.	03
2.	**Financial Statements:** Balance sheet: assets, liabilities. Income statement: concept of income, concept of expenses, concept of gain and losses. Components of the income statement. Other concepts of income. Cash flow statements: purpose, components, and categories. Preparation of cash flow	03

	statements: concept, activities. Accounting and pricing.	
3.	**Financial Statement Analysis**: Business objectives, measures. Ratios: Price/Earnings, Profit margin, investment, capital asset intensity, working capital measures, liquidity and solvency. Analysis of cash flow statements. Break-even analysis, CVP analysis. Full Cost: cost concepts, direct and indirect costs, product costing systems, non-manufacturing costs, cost analysis, product pricing.	04
4.	**The concept of Financial Management** – Definition, nature, objectives, functions and scope of financial management, Preparation of financial plan – its objectives, essential features, consideration in formulating financial plan, Capitalization: over, under and fair capitalization. Concept of risk and returns, Time value of money.	04
5.	**Investment Decisions**: Capital budgeting techniques. Financing Decisions: Cost of Capital – Meaning, definition, classification and computation of specific weighted and marginal cost of capital. Capital structure – Definition, factors determining the financial structure, Leverage Analysis – Financial operating and combined leverages, Dividend decisions: Dividend policy, Dividend Theories, Factors affecting dividend decisions. Long term financing, Sources of long term financing.	04
6.	**Working Capital Management**: Concept of working capital – Classification, importance, factors determining adequate value of working capital. Estimation of working capital requirements. Financing of working capital – Long- medium-short term. Trends in Financing of working capital by banks, Inventory management. Cash Management and Receivable Management.	06

References-
Text Books:
1. Maheshwari, S.N. and Maheshwari, S.K., Financial Accounting, Vikas Publishing House
2. Leach, C.J. and Melicher, R.W.: Entrepreneurial Finance, Thomson.
References:
1. Ghosh, T.P., Financial Accounting for Managers, Taxmann Allied Services
2. Balwani, N., Accounting and Finance for Managers, Excel Books
3. Gupta, A., Financial Accounting for Management, Prentice Hall
4. Bhattacharyya, A.K., Financial Accounting for Business Managers, PHI Publishing
5. Jain, S.P. and Narang, K.L., Advanced Accountancy, Kalyani Publishers.
6. Stanton, J.M., Entrepreneurial Finance – For New and Emerging Businesses, Thomson
7. Smith, J.K., Smith, R.L. and Bliss, R.T., Entrepreneurial Finance, Stanford University

Press

8. Smith, J.K. and Smith, R.L., Entrepreneurial Finance, Wiley
9. Rogers, S., Entrepreneurial Finance, McGraw Hill
10. Chandra, P., Financial Management, McGraw Hill

Evaluation	Weightage	Particulars	Converted Marks
ISE	20%	Attendance and participation	05
		Assignment No. 1	05
		Assignment No. 2	05
		Assignment No. 3	05
Unit Test 01	15%	Unit Test 25 Marks	15
Unit Test 02	15 %	Unit Test 25 Marks	15
ESE	50%	ESE 50 Marks	50

Class- Final Year **B. Tech**	Semester-**VIII**	**L**	**T**	**P**	**Credits**
Course Code : ED 4006	Course : **Marketing for Entrepreneurs.**	2		--	2

Course Description-

To familiarize the students with the marketing function & concept of marketing mix & study the marketing mix of some start-ups, companies operating in India. This course will give overall understanding of marketing management which will help them in developing their own marketing decisions & in understanding the importance of market survey techniques. It will also help them in conducting suitable market survey for their own selected products

Course Learning Outcomes:

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

CO_ED4006_1. Apply basic principles of marketing for various products.

CO_ED4006_2. Prepare market survey.

CO_ED4006_3. Select proper product mix & pricing decision.

CO_ED4006_4. Select proper digital marketing technique for selected business.

Prerequisite: General knowledge of market, sales, distribution & advertizing & clear concept about own business model.

	Course Content	
Unit No.	**Description**	**Hrs.**
1.	**Introduction (Nature & Scope of Marketing):** Evolution; core marketing concepts, selling concept, marketing concept, Holistic marketing concept, portfolio approach-BCG matrix;	04
2.	**Marketing Environment:** Demographic, economic, political, legal, socio cultural, technological environment (Indian context); environmental scanning to discover marketing opportunities, Segmentation Targeting and Positioning, difference between segmentation, targeting and positioning, customer value proposition.	04
3.	**Marketing Research-** Concept & practice, Steps in Marketing Research, Assessment of demand & supply, Preparation of survey questionnaire.	04
4.	**Product Decisions:** Concept of PLC, product classification, product line decision, product mix decision, new product development, branding decisions, packaging & labeling, Service as a part of Product.	04

	Pricing Decisions: Determinants of price, pricing methods (non-mathematical treatment). Adapting Price (Geographical pricing, promotional pricing and differential pricing), pricing strategies for start-ups.	
5.	**Promotion Mix:** Factors determining promotion mix, promotional tools – basics of advertisement, sales promotion, public relations & publicity and personal selling. Place (Marketing channels): Channel functions, channel levels, types of intermediaries (types of retailers, types of wholesalers).	04
6.	**Digital Marketing:** Digital Marketing Overview, Seven "C" of Digital Marketing, Digital Marketing vs e-marketing, Search Engine Optimization (SEO), Social Media Optimization (SMO), Pay per Click (PPC), Email Marketing	04

References-

Text Books:
1. For B2C = Kotler, P., Keller, K.L., Koshy, A. and Jha, M.: Marketing Management, Pearson
2. For B2B = Sarin, S.: Strategic Brand Management for B2B Markets, Sage

References:
1. Kotler P. & Armstrong, G., Principles of Marketing, Pearson
2. Amico, Z.D., Marketing, Cengage
3. Boone, L.E. and Kurtz, D.L., Principles of Marketing, Thomson South-Western
4. Hoffman, K.D. and Bateson, J.E.G., Marketing of Services, Cengage
5. EDP Resourse material by EDI, Ahmedabad.

Evaluation	Weightage	Particulars	Converted Marks
ISE	20%	Attendance and participation	05
		Assignment No. 1	05
		Assignment No. 2	05
		Assignment No. 3	05
Unit Test 01	15%	Unit Test 25 Marks	15
Unit Test 02	15 %	Unit Test 25 Marks	15
ESE	50%	ESE 50 Marks	50

Class- Final Year **B. Tech**	Semester-VIII	L	T	P	Credits
Course Code : ED 4002	Course : **Project Feasibility Analysis**	3	--	--	3

Course description-

To improve and update knowledge of new entrepreneurs in the areas of project preparation & appraisal techniques; decision-making process in the sector of industrial, infrastructure & sustainable opportunities that would lead to improved viability, returns and effective investment decisions .Writing a business plan which can gain interest of the fund providers like venture capitalists and other sources of funding.

Course Learning Outcomes:

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

CO_ED4002_1. Prepare business Plan for selected business.

CO_ED4002_2. Make risk analysis& market analysis of selected project.

CO_ED4002_3. Make technical appraisal of selected project.

CO_ED4002_4. Make financial appraisal of selected project.

Prerequisite: General knowledge of economics & clear concept about own business model.

	Course Content	
Unit No.	**Description**	**Hrs.**
1.	**Project appraisal Introduction-**Project Development Cycle, Identifying data requirements and analyzing their suitability for preparation of feasibility studies, project formulation, screening for pre-feasibility studies, stages of feasibility report preparation, Project Analysis including Market Analysis, Technical Analysis & Financial Analysis, applying various techniques and integrating the data gathered into a full-fledged business plan.	06
2.	**Project Analysis-**Environmental Analysis, Risk Analysis, Infrastructure Development & Financing, Risk Management, Risk identification, Qualitative risk analysis, Quantitative risk analysis, Risk planning, Risk control, Evaluating the rewards & risks for sustainable opportunities. National Cost-Benefit Analysis, Financing Sustainable Opportunities.	06
3.	**Business Plan:** What is business plan, Entrepreneurial opportunities and Business Plan. Preparing business plan. (Practical Exercises on preparation of business plan)Components of Business Plan, Executive summary, other components. Project report contents.	06

4.	**Commercial Appraisal:** Economic feasibility and commercial viability, market analysis, Market Research, Industry Analysis, Competitor analysis, defining the target market, market segmentation, market positioning, building a marketing plan, market strategy.	06
5.	**Technical Appraisal:** Operation and Production Plan: Types of production systems, Product design and analysis, New product development, location and layout decisions, project layout, plant and technology choices, product specification and customer needs, production planning and control, Commercializing Technologies	06
6.	**Financial Appraisal:** pro forma income statements, financial projections, working capital requirement, funds flow and Cash flow statements; Ratio Analysis.	06

References-

Text Books:

Dwivedi, A.K.: Industrial Project and Entrepreneurship Development, Vikas Publishing House

References:

1. Bangs Jr., D.H., The Business Planning Guide. Dearborn Publishing Co.
2. Katz, J.A. and Green, R.P., Entrepreneurial Small Business, McGraw Hill
3. Mullins, J. and Komisar R., Getting to Plan B, Harvard Business Press
4. O'Donnell, M., The Business Plan: Step by Step, UND Center for Innovation.
5. Scarborough, N.M. and Zimmerer, T.W., Effective Small Business Management, Pearson
6. Pickle, H.B.and Abrahamson, R.L., Small Business Management, Wiley
7. Desai, V., Dynamics of Entrepreneurial Development & Management, Himalaya Publishing
8. Kao, J., Creativity & Entrepreneurship, Prentice Hall
9. Singh, Narendra, Project Management & Control, Himalaya Publications

Evaluation	Weightage	Particulars	Converted Marks
ISE	20%	Attendance and participation	05
		Assignment No. 1	05
		Assignment No. 2	05
		Assignment No. 3	05
Unit Test 01	15%	Unit Test 25 Marks	15
Unit Test 02	15 %	Unit Test 25 Marks	15
ESE	50%	ESE 50 Marks	50

Class- Final Year **B. Tech** Semester-**VIII**		L	T	P	Credits
Course Code : ED 4008	Course Name : **ED Lab.**	--	--	4	2

Course description -

In this course student will have hands on experience with different project software's for financial projections.

Course Learning Outcomes:

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

CO_ED4008_1. Apply different software like **Live plan, business plan pro, strategizer business canvas, online** business **plan by SIDBI,** for preparing financial projections of selected project.

Prerequisite: General knowledge of business & clear concept about own business model.

Evaluation-ISE 50 marks. (By Mentor)

Student should work with at least two software and acquire skill to use one software to make final project report.

Assignment-Business plan for selected project using above mentioned any one software.

Infrastructure Required- Lab with at least 10 computers with internet connection.

Class- Final Year **B. Tech**	Semester-**VIII**	**L**	**T**	**P**	**Credits**
Course Code : ED 4010	Course : **Project Feasibility Report**	--	--	12	12

Course description -

Student will prepare technically feasible and economically viable detailed project report including market survey.

Course Learning Outcomes:

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

CO_ED4010_1. Apply knowledge of engineering, economics, marketing and finance for preparation of project report.

CO_ED4010_2. Make commercial, technical and financial appraisal of project.

Prerequisite: General knowledge of business, technical & commercial aspects, clear concept about own business model.

Student will start working on collection of data required for business plan. During semester he may require to visit various support organizations, similar industries , suppliers of raw materials, machinery, special service providers. He has to conduct market survey. For this student can go out of campus with prior permission of mentor. Mentor should maintain this record .Students are required to work independently by taking guidance from mentor/Head CIIED/faculty on expert panel of CIIED.

Continuous efforts taken by student should be observed by mentor for ISE evaluation. At the end of semester detailed project report will be presented before Expert committee for ISE evaluation of 100 marks.

Then student will appear for ESE. Project report evaluation &assessment will be done by a panel of experts appointed by COE.

Evaluation	Weightage	Particulars	converted Marks
ISE	10%	Preliminary project report	10
	20%	Market Survey	20
	20%	Completion of Legal Aspects	20
	50%	Final Report	50
ESE	100%	ESE -Final Report	100

Class- Final Year **B. Tech**	Semester-**VIII**	**L**	**T**	**P**	**Credits**
Course Code : ED 4012	Course Name : EDP programs	--	--	--	**3**

Course description -

Student will attend short term intensive EDP program organized either in house or by any authorized agency approved by CIIED.

Course Learning Outcomes:

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

CO_ED4012_1. Apply knowledge of engineering, economics, marketing and finance for formulation of business plan, starting & managing new business.

Prerequisite: General knowledge of business & clear concept about own business model.

Student will undergo training programs organized by CIIED.

Programs on marketing, Finance management, project report preparation by professional agencies. Students are required to apply this knowledge for preparing final project report.

Evaluation- ISE 50 marks by mentor for active participation in programs by completing various activities/assignments in program.