SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER 3

CE 201 MECHANICS OF SOLIDS

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Mechanics of Solids**	Course code**: CE 201**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Types of external loads - internal stresses - normal and shear stresses - strain - Hooke's law - working stress - stress strain diagrams - Poisson's ratio - relationship between elastic constants	9	15
II	Elongation of bars of constant and varying sections – statically indeterminate problems in tension and compression – Temperature effects – strain energy and complementary energy-strain energy due to tension, compression and shear	9	15
III	Bending Moment & Shear force: Different types of beamsvarious types of loading –Relationship connecting intensity of loading , shearing force and bending moment-shear force and bending moment diagrams for cantilever beams and Simply supported beams for different types of loading	9	15
IV	Stresses in beams of symmetrical cross sections: Theory of simple bending –assumptions and limitations – Normal stresses in beams- Moment of resistance - beams of uniform strength - beams of two materials – strain energy due to bending - shearing stresses in beams	9	15
V	Analysis of stress and strain on oblique sections: Stress on inclined planes for axial and biaxial stress fields - principal stresses - Mohr's circle of stress Thin and Thick Cylinders: Stresses in thin cylinders – thick cylinders - Lame's equation – stresses in thick cylinders due to internal and external pressures Torsion: Torsion of solid and hollow circular shafts.- Pure shear- strain energy in pure shear and torsion. Springs: Close coiled and open coiled helical springs	9	20
VI	Deflection of statically determinate beams: Differential equation of the elastic curve - Method of successive integration, Macaulay's method, Method of superposition, moment area method. Theory of columns: Direct and bending stresses in short columns- Kern of a section. Buckling and stability-Euler's buckling/crippling load for columns with different end conditions- Rankine's formula	11	20

TEXT BOOKS:

1	Rattan, Strength of Materials, 2e McGraw Hill Education India, 2011
2	Timoshenko , Strength of Materials Vol. I & Vol. II , CBS Publishers & Distributers, New Delhi

REFERENCES:

1	Crandall, An Introduction to Mechanics of Solids 3e McGraw Hill Education India 2014
2	Egor P Popov , Mechanics of solids, Prentice Hall of India, New Delhi
3	M.L. Gambhir, Fundamentals of structural Mechanics and analysis, Prentice Hall India
4	Stephen H Crandall, N C Dahi, Thomas J L, M S Sivakumar, an introduction to Mechanics of Solids , McGraw hill Education, 3rd edition
5	Cheng, Statics and Strength of Materials 2e McGraw Hill Education India 2013
6	Hearn E.J., Mechanics of Materials, Pergamon Press, Oxford
7	Nash W A, Strength of Materials (SIE) (Schaum's Outline Series) 5e McGraw Hill Education India 2010
8	Rajput R.K. Strength of Materials, S.Chand&company Ltd., New Delhi
9	James M Gere & Stephen P Timoshenko , Mechanics of Materials , CBS Publishers & Distributers, New Delhi
10	Punmia B. C., A. K. Jain and A. K. Jain, Mechanics of Materials, Laxmi Publications(P) Ltd, New Delhi

PREREQUISITE: BE 100 Engineering Mechanics

COURSE OBJECTIVES:

1	To enable the students to calculate stresses and strains generated in material due to external loads for various types of loading conditions

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Determine internal forces in members subject to axial loads, shear, torsion and bending and plot their distributions
2	Analyse normal, shear, torsion and bending stresses and strains
3	Evaluate the state of stress at a point and determine the principal and maximum shear stresses using equations as well as the Mohr's circle.
4	Illustrate the column buckling and ability to calculate critical load and stress.
5	Assess the conditions of slope and deflection of beams

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2												2		
CO2	3	3												2		
CO3	3	3												2		
CO4	2	3	3											2	2	
CO5	2	2	3											2	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Fundamental knowledge about internal forces in members subject to different load conditions.
	PO2	2	Identify and analyze the practical problems.
CO2	PO1	3	Fundamental knowledge about internal forces in members subject to different load conditions
	PO2	3	Analyze and apply the engineering knowledge.
CO3	PO1	3	Fundamental knowledge about internal forces in members subject to different load conditions.
	PO2	3	Analyze and apply the engineering knowledge.
CO4	PO1	3	Application of fundamental knowledge.
	PO2	3	Analyze the practical problems.
	PO3	3	Design of members.
CO5	PO1	2	Fundamental knowledge about internal forces in members subject to different load conditions.
	PO2	2	Analyze the practical problems.
	PO3	3	Design of members

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Graduates shall acquire good knowledge in analysis, design etc with good foundation in mathematics, basic science etc.
CO2	**PSO1**	**2**	Graduates shall acquire good knowledge in analysis, design etc with good foundation in mathematics, basic science etc.
CO3	**PSO1**	**2**	Graduates shall acquire good knowledge in analysis, design etc with good foundation in mathematics, basic science etc.
CO4	**PSO1**	**2**	Graduates shall acquire good knowledge in analysis, design etc with good foundation in mathematics, basic science etc.
	PSO2	**2**	Understand about infrastructural developments.
CO5	**PSO1**	**2**	Graduates shall acquire good knowledge in analysis, design etc with good foundation in mathematics, basic science etc.
	PSO2	**2**	Understand about infrastructural developments

CE 203 FLUID MECHANICS

COURSE INFORMATION SHEET:

Program: **Civil Engineering**	Degree :**B-Tech**
Course**: Fluid mechanics**	Course code**: CE 203**
L-T-P**: 3-1-0**	Credit**: 4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Fluid properties - density – specific gravity - surface tension and capillarity - vapour pressure - viscosity and compressibility - Classification of Fluids (No questions to be asked) . Fluid statics: Fluid pressure, variation of pressure in a fluid, measurement of pressure using manometerssimple manometers, differential manometers, Pressure head. Forces on immersed plane and curved surfaces. Pressure distribution diagram for vertical surfaces, Practical application of total pressure (spillway gates). Buoyancy and Floatation: Buoyant force, stability of floating and submerged bodies, metacentre and metacentric height, Analytical and experimental determination of metacentric height.	8	15
II	Kinematics of fluid flow: Methods of describing fluid motion, Lagrangian and Eulerian methods, Types of fluid flow: steady and unsteady flow, uniform and non-uniform flow, one, two and three dimensional flow, laminar and turbulent flow, rotational and irrotational flow. Types of flow lines: stream line, path line, streak lines, conservation of mass, equation of continuity in one, two and three dimensions, (Derivation in Cartesian co-ordinate system only) Velocity & Acceleration of fluid particle, convective and local acceleration, Deformation of fluid elements: circulation and vorticity, velocity potential, stream function, equipotential lines, flow net, uses of flow net; Vortex motion, free and forced vortex (no problems)	8	15
III	Dynamic of fluid flow: Euler's equation of motion and integration of Euler's equation of motion along a streamline. Bernoulli's Equation, Energy correction factors, Applications of Bernoulli's equation : Pitot tube, Venturimeter and orifice meter. Momentum Principle- Steady flow momentum equation- Momentum correction factor, Force computation on a pipe bend	8	15
IV	Flow through orifices: Different types of orifices, Flow over a sharp edged orifice, Hydraulic coefficients – Experimental determination of these coefficients, flow through large rectangular orifice, Flow through submerged orifices, flow under variable heads, time of emptying. Flow over weirs: flow over rectangular, triangular and trapezoidal sharp crested weir,	8	15

	Cipolletti weir, Broad crested weir, Submerged weirs, Proportional weir.		
V	Flow through pipes: Viscous flow - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen Poiseulle's Eqn) - Hydraulic and energy gradient - flow through pipes - Darcy - Weisbach's equation - pipe roughness -friction factor- Moody's diagram- Major and minor losses of flow in pipes - Pipes in series and in parallel	12	20
VI	Boundary layer theory-no slip condition, boundary layer thickness, boundary layer growth over long thin plate, laminar, turbulent boundary layer, laminar sub layer, Momentum integral equation of boundary layer (no derivation), Blasius boundary layer equations for laminar and turbulent boundary layer. Drag and lift on Immersed bodies-Pressure drag and friction drag, profile drag, Drag and lift co-efficient computation of drag on a flat plate. Separation of boundary layer and control.	12	20

TEXT BOOKS:

1	Modi P. N. and S. M. Seth, Hydraulics & Fluid Mechanics, S.B.H Publishers, New Delhi, 2002.
2	Subramanya K., Theory and Applications of Fluid Mechanics, Tata McGraw-Hill, 1993.

REFERENCES:

1	Streeter.V.L. Fluid Mechanics, Mc Graw Hill Publishers.
2	Bruce R Munson, Donald F Young . Fundamentals of Fluid Mechanics, John Wiley & sons, 2011.
3	Jain A. K., Fluid Mechanics, Khanna Publishers, Delhi, 1996.
4	Joseph Katz, Introductory Fluid Mechanics, Cambridge University Press, 2015
5	Arora.K.R. Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers, 2005.
6	Narasimhan S., A First Course in Fluid Mechanics, University Press (India) Pvt. Ltd., 2006
7	Frank.M.White, Fluid Mechanics, Mc Graw Hill, 2013.
8	Mohanty.A.K. Fluid Mechanics, Prentice Hall, New Delhi, 2011
9	Narayana Pillai,N. Principles of Fluid Mechanics and Fluid Machines, University Press, 2011.
10	Kumar.D.N. Fluid Mechanics and Fluid power Engineering, S.K.Kataria & sons, 2013.

PREREQUISITE: nil

COURSE OBJECTIVES:

1	To understand the basic properties of the fluid, fluid statics, kinematics, and fluid dynamics so as to analyse and appreciate the complexities involved in solving the fluid flow problems
2	To give an introduction to the fundamentals of fluid flow and its behaviour so as to equip the students to learn related subjects and their applications in the higher semesters.
3	To develop the skill for applying the fluid statics, kinematics and dynamics of fluid flow concepts for solving civil engineering problems.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain the basics of fluid flow and pressure in fluids at rest
2	Analyze the condition of stability of a body in a fluid based on relative positions of its centre of buoyancy and metacentre
3	Explain kinematics of fluid flow, methods to describe fluid flow, continuity equation and velocity and acceleration of fluid particles
4	Apply Bernoulli's equation to fluid flow problems involving venturimeter, orifice meter, pitot tube, orifices, mouthpieces, notches and weirs
5	Analyse the flow through pipes and the major and minor energy losses
6	Explain the concept of development of boundary layer over a long thin plate

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2													3		
CO2	3	3												3		
CO3	2													3		
CO4	3	2												3		
CO5	3	3												3		
CO	2													2		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	The basics of fluid mechanics form the basis of the knowledge of a Civil Engineer to encounter any problem in the field of Water resources engineering
CO2	PO1	3	Stability of floating and submerged bodies in water is essential engineering knowledge for those who aspire to study fluid-structure interactions.
CO3	PO2	3	The student develops the ability to solve the problems on the stability of floating structures like ships and boats
	PO1	2	The Civil Engineer needs to understand how to analyse a flow without having to consider the forces causing the motion
CO4	PO1	3	The simple methods that have been used to determine the discharge and velocity of flow without using any electronic equipment, helps build the logic of a Civil Engineer
	PO2	2	The logic of the simple instruments like the venturimeter and pitot tube can inspire the students to design similar simple devices using the basic concepts of fluid flow.
CO5	PO1	3	The mechanics behind pipe flow and the energy losses associated with it provides a fundamental engineering knowledge to the student
	PO2	3	Analysis of flow through pipes is a promising problem solving area in Civil Engineering
CO6	PO1	2	Boundary layer theory is a problem still awaiting a lot of research and analysis and needs to be understood thoroughly

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will demonstrate knowledge in analysis of fluid flow systems and will analyze pressure of a fluid at rest
CO2	**PSO1**	**3**	Graduates will analysis the stability condition of a body in a fluid using the acquired knowledge
CO3	**PSO1**	**3**	Graduates will understand and will be able to apply the knowledge of fluid kinematics
CO4	**PSO1**	**3**	Graduates will analyze different numerical problems using Bernoulli's equation.
CO5	**PSO1**	**3**	Graduates will be able to analyze pipe flow problems
CO6	**PSO1**	**2**	Graduates will understand the basic concept of boundary layer

CE 205 ENGINEERING GEOLOGY

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Engineering Geology**	Course code**: CE 205**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Relevance of geology in Civil Engineering. Subdivisions of Geology. Weathering, types and its engineering significance. Laboratory tests used in civil engineering for assessing intensity of weathering. Engineering classification of weathered rock masses. Soil profile. Geological classification of soils	8	15
II	Hydrogeology-occurrence of groundwater, Types of aquifers, permeability / hydraulic conductivity. Engineering significance of subsurface waterproblems created in construction, as an erosional agent. Methods to control of subsurface waterbarriers and liners, drains and wells.(Resistivity survey of groundwater may be demonstrated)	11	15
III	Minerals- Properties that affect the strength of minerals. Physical properties and chemical composition of following minerals -quartz, feldspars (orthoclase and plagioclase), micas (biotite and muscovite), amphibole (hornblende), pyroxene (augite and hypersthene), gypsum, calcite, clay minerals (kaolinite), their chemical formulae. Earth quakes- in relation to internal structure of earth and plate tectonics	8	15
IV	Rocks as aggregates of minerals. Basic concepts igneous, sedimentary and metamorphic rocks, Brief account of following rocks- granite, basalt, sandstone, limestone, shale, marble and quartzite. Rock features that influence the strength of rocks as construction material-concepts of lineation and foliation-schistosity and gneissosity. Rock types of Kerala. Brief account of engineering properties of rocks used as construction material (building and foundation) and road aggregates. Assessment of these properties.(Students should be taught to identify common rock forming minerals and common rocks based on their physical properties).	10	15
V	Attitude of geological structures- strike and dip. Brunton compass. Deformation structures and their engineering significance- folds, faults and joints. Geological factors considered in the construction of dams and reservoirs, tunnels. (Simple exercises based on geological/topographic maps for determination of dip, apparent dip and thickness of lithological	11	20

	beds and preparation of geological cross sections should be performed. The students should be instructed in handling clinometer/Brunton compass to determine strike and dip)		
VI	Introduction to natural hazards-Mass movements (Landslides), floods, their common management strategies. Coastal Processes- waves, currents and landforms. Types of coastal protection strategies. Soil erosion- causes and types and soil conservation measures.	8	20

TEXT BOOKS/REFERENCES:

1	Duggal, SK,Rawal,N and Pandey, HK (2014) Engineering Geology, McGraw Hill Education, New Delhi
2	Garg, SK (2012) Introduction to Physical and Engineering Geology, Khanna Publishers,New Delhi
3	Gokhale, KVGK (2010) Principles of Engineering Geology, BS Pubications, Hyderabad
4	Kanithi V (2012) Engineering Geology, Universities Press (India) Ltd., Hyderabad
5	Singh, P (2004) Engineering and General Geology, S. K. Kataria and Sons, New Delhi
6	Bennison, GM, Olver, PA and Moseley, KA (2013) An introduction to geological structures and maps, Routledge, London
7	Gokhale, NW (1987) Manual of geological maps, CBS Publishers, New Delhi

PREREQUISITE: BE 100 Engineering Mechanics

COURSE OBJECTIVES:

1	Appreciation of surface of earth as the fundamental foundation structure and the natural phenomena that influence its stability

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain the relevance of Engineering Geology in Civil Engineering and classify the different weathering processes
2	Explain the concepts of subsurface water and its engineering significance.
3	Interpret earthquakes in relation to internal structure of the earth.
4	Identify common rocks and rock forming minerals based on their physical properties
5	Identify the attitude of geological structures and instruments used for the same.
6	Distinguish various natural hazards and its mitigation methods.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1	-	1												3	
CO2	-	-	1												3	
CO3	-	-	1												2	
CO4	3	2	-												2	
CO5	3	-	-												-	
CO6	-	-	-			3									2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	1	Apply the knowledge from engineering geology about weathering and all to solve the problems affecting the society and take relevant measures to ensure the safety.
	PO3	1	Solve the complex engineering problems regarding the availability of raw materials for construction and find suitable alternatives for the materials that are scarce.
CO2	PO3	1	Study the engineering significance of subsurface water in construction and create awareness about various sources of water and how it can affect the various fields of construction and the stability of structures.
CO3	PO3	1	Interpret the various causes and effects of earthquakes and develop solutions to minimize its effects.
CO4	PO1	3	Solve the problems regarding the availability of raw materials for construction by studying the properties and composition of materials and find suitable alternatives for the materials that are scarce.
	PO2	2	Identifying each mineral with respect to their physical properties helps students to classify the types and properties of rocks and their suitability in various fields of engineering.
CO5	PO1	3	Analyse the attitude of geologic structures and helps to analyse various engineering activities of the structures.
CO6	PO6	3	Study the various natural hazards, its causes, remedies and prevention of adverse situations in society.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO2	3	Graduates can solve the problems affecting the society and take relevant measures to ensure the safety of nature by analyzing the geological aspects.
CO2	PSO2	2	The graduates of the programme are able to know about subsurface water and its problems in all geological aspects and can suggest preventive measures to overcome.
CO3	PSO2	2	Graduates can work on various causes and effects of earthquakes and shall develop innovative methods and solutions to minimise the effects of earthquake.
CO4	PSO2	2	Graduates will apply the knowledge on Earth's resources and minerals in infrastructural development involving economical, environmental, societal and safety factors.

CO6	**PSO2**	**2**	Knowledge on Natural hazards management is inevitable in all engineering practices and graduates can convey it in day to day life and can make common man more aware about the same.

CE 207 SURVEYING

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Surveying**	Course code**: CE 207**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Surveying- Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Local attraction, Declination, Dip, Latitude and Departure, Methods of orientation, Principle of resection	7	15
II	Levelling: Principles of levelling- Dumpy levelbooking and reducing levels, Methods- simple, differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling Contouring: Characteristics, methods, uses.	7	15
III	Area and Volume: Various methods of computation. Theodolite survey: Instruments, Measurement of horizontal and vertical angle. Mass diagram: Construction, Characteristics and Use	6	15
IV	Triangulation: Triangulation figures, Strength of figure, Triangulation stations, Inter visibility of stations, Towers and signals – Satellite Stations and reduction to centre	8	15
V	Theory of Errors – Types, theory of least squares, Weighting of observations, Most probable value, Application of weighting, Computation of indirectly observed quantities - method of normal equations.	8	20
VI	Electromagnetic distance measurement (EDM) – Principle of EDM, Modulation, Types of EDM instruments, Distomat Total Station – Parts of a Total Station – Accessories – Advantages and Applications, Introduction to Astronomical terms, Field Procedure for total station survey, Errors in Total Station Survey	6	20

TEXT BOOKS:

1	Prof. T.P.Kenetkar & Prof.S.V.Kulkarni - Surveying and Levelling , Pune Vidyarthi Griha Prakashan,2004
2	N N Basak, Surveying and Levelling, Mc GrawHill Education

REFERENCES:

1	R.Agor - A Text book of Surveying and Levelling, Khanna Publishers, 2005
2	C. Venkatramaiah, Textbook of Surveying, Universities Press (India) Private Limited 2011
3	James M Andersen, Edward M Mikhail, Surveying Theory and Practice, McGraw Hill Education
4	Dr. B.C.Punmia , Ashok Kumar Jain &Arun Kumar Jain - Surveying , Laxmi publications (P)Ltd , 2005
5	S.K.Duggal - Surveying Vol. I, Tata Mc Graw Hill Ltd ,Reprint 2015

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To introduce the principle of surveying
2	To impart awareness on the various fields of surveying and types of instruments
3	To understand the various methods of surveying and computations

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Summarize the knowledge on the basics of surveying
2	Explain the knowledge on different methods of surveying
3	Estimate measurement errors and apply corrections
4	Apply the knowledge of calculations of area and volume of the earth works in field of study
5	Extend the study of surveying from conventional methods and instruments used

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2													1		
CO2					3									1		
CO3	3		3											3		
CO4	3	2	1											3		
CO5	2				1									2		3

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	The basics of survey helps to encounter any problem in the field of Surveying
CO2	PO5	3	different method used in surveying is useful when new updates comes
CO3	PO1	3	Applying the knowledge of errors to adjusting the triangulation figures in survey
	PO3	3	can design solutions for complex states of surveying like triangulations based on measurement taken from field
CO4	PO1	3	Basic knowledge of area and volume computation of a given plot
	PO2	2	Using different methods of calculation of area and volume any complex problems can be solved in surveying
CO5	PO3	1	design and develop solutions of any kind of surveys
	PO1	2	With different instruments we can find solution for any complex problems related to surveying
	PO5	1	knowledge on modern instruments used for surveying and how it will useful when new updates comes

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	1	The graduates will be able to assess enough knowledge in surveying principles
CO2	PSO1	1	The graduates will be able to know about modern surveying methods
CO3	PSO1	2	The graduates will be able to identify the error and correct it
CO4	PSO1	3	The graduates can demonstrate their knowledge in area and volume computation
CO5	PSO3	3	The graduates will be able to work with modern instruments
	PSO1	2	The graduates will be able to identify latest surveying instruments

MA201 LINEAR ALGEBRA AND COMPLEX ANALYSIS

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Linear Algebra and Complex Analysis**	Course code**: MA201**
L-T-P**:3-0-1**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Complex differentiation Text 1[13.3,13.4] Limit, continuity and derivative of complex functions Analytic Functions Cauchy–Riemann Equation(Proof of sufficient condition of analyticity & C R Equations in polar form not required)-Laplace's Equation Harmonic functions, Harmonic Conjugate	9	15
II	Conformal mapping: Text 1[17.1-17.4] Geometry of Analytic functions Conformal Mapping, Mapping $w = z^2$ conformality of $w = e^z$. The mapping z w z 1 Properties of z w 1 Circles and straight lines, extended complex plane, fixed points Special linear fractional Transformations, Cross Ratio, Cross Ratio property-Mapping of disks and half planes Conformal mapping by w sinz & w cos z (Assignment: Application of analytic functions in Engineering)	10	15
III	Complex Integration. Text 1[14.1-14.4] [15.4&16.1] Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method Cauchy's Integral Theorem(without proof), Independence of path(without proof), Cauchy's Integral Theorem for Multiply Connected Domains (without proof) Cauchy's Integral Formula-Derivatives of Analytic Functions(without proof)Application of derivative of Analytical Functions Taylor and Maclaurin series(without proof), Power series as Taylor series, Practical methods(without proof) Laurent's series (without proof)	10	15
IV	Residue Integration Text 1 [16.2-16.4] Singularities, Zeros, Poles, Essential singularity, Zeros of analytic functions Residue Integration Method, Formulas for Residues, Several singularities inside the contour Residue Theorem. Evaluation of Real Integrals (i) Integrals of rational functions of sinT and cosT (ii)Integrals of the type ³ f f f (x)dx (Type I, Integrals from 0 to f) (Assignment : Application of Complex integration in Engineering)	9	15
V	Linear system of Equations Text 1(7.3-7.5) Linear systems of Equations, Coefficient Matrix, Augmented Matrix Gauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination-Three possible cases, Row Echelon form and Information from it.	9	20

	Linear independence-rank of a matrix Vector Space-Dimension-basis-vector spaceR3 Solution of linear systems, Fundamental theorem of nonhomogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only		
VI	Matrix Eigen value Problem Text 1.(8.1,8.3 &8.4) Determination of Eigen values and Eigen vectors-Eigen space Symmetric, Skew Symmetric and Orthogonal matrices – simple properties (without proof) Basis of Eigen vectors-Similar matrices Diagonalization of a matrixQuadratic forms-Principal axis theorem(without proof) (Assignment-Some applications of Eigen values(8.2))	9	20

TEXT BOOKS:

1	Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley

REFERENCES:

1	Dennis g Zill&Patric D Shanahan-A first Course in Complex Analysis with Applications-Jones&Bartlet Publishers
2	B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi
3	Lipschutz, Linear Algebra,3e (Schaums Series)McGraw Hill Education India 2005
4	Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To equip the students with methods of solving a general system of linear equations
2	To familiarize them with the concept of Eigen values and diagonalization of a matrix which have many applications in Engineering
3	To understand the basic theory of functions of a complex variable and conformal Transformations

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Solve any given system of linear equations
2	Find the Eigen values of a matrix and how to diagonalise a matrix
3	Identify analytic functions and harmonic functions
4	Evaluate real definite Integrals as application of Cauchy integral theorem
5	Evaluate real definite Integrals as application of ResidueTheorem
6	Identify conformal mappings(vi) find regions that are mapped under certainTransformations

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3										
CO3	3	3										
CO4	3	3										
CO5	3	3										
CO6	3	3										

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	3	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO2	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	3	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO3	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	3	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO4	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	3	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
CO5	PO2	3	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO6	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	3	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences

HS200 BUSINESS ECONOMICS

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Business Economics**	Course code**: HS200**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Nature of Economics Definitions of Economics and their limitations, Economic Problems (2 Hrs.), Economic Systems, meaning of Business or Managerial Economics (2 Hrs.)and its role and relevance in managerial decision making in an industrial setting (2 Hrs).	6	15
II	Demand and Supply Analysis Demand Curve, Demand function (2 Hrs.), Elasticity of demand and its estimation (2 Hrs.), Supply curve, equilibrium price and price mechanism (2 Hrs).	6	15
III	Production Economics Economies of Scale and Diseconomies of Scale (1 Hr.), Production and Cost Functions. Factors of Production (2 Hrs.), Law of Diminishing marginal Productivity. Construction and analysis of Break Even Charts (3 Hrs.)	6	15
IV	Market Structure and Price-Output Decisions Price and output determination under Perfect Competition, Monopoly and Monopolistic Competition (3 Hrs.). Collusion and Cartel, Nash Equilibrium (3 Hrs.).	6	15
V	Money, National Income and Taxation Money, Emerging Bit Coin concept, Quantity Theory of Money, Interest Rate Management (2 Hrs), Open Market Operations by RBI, Selective Credit Controls, SLR, CRR (2 Hrs), Definition & Measurement of National Income, methods, sectors of economy (3 Hrs), inflation, deflation, trade cycles-ValueAdded Tax (2 Hrs).	9	20
VI	Investment Decisions and Balance Sheet Analysis Capital Budgeting, Investment Analysis – NPV, IRR, Profitability Index, ARR, Payback Period (3 Hrs), Depreciation, Time value of money. Business Forecasting– Elementary techniques (2 Hrs). Balance sheet preparation principles and interpretation (4 Hrs)	9	20

TEXT BOOKS:

1	Yogesh, Maheswari, Management Economics , PHI learning, NewDelhi, 2012

REFERENCES:

1	Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010.
2	Khan M Y, Indian Financial System, Tata McGraw Hill, 7th edition, 2011
3	Samuelson, Managerial Economics, 6th edition, Wiley
4	Snyder C and Nicholson W, Fundamentals of Microeconomics, Cengage Learning (India), 2010
5	Truett, Managerial Economics: Analysis, Problems, Cases, 8th Edition, Wiley Welch, Economics: Theory and Practice 7th Edition, Wiley

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To familiarize the prospective engineers with elementary Principles of Economics and Business Economics.
2	To acquaint the students with tools and techniques that is useful in their profession in Business Decision Making which will enhance their employability;
3	To apply business analysis to the "firm" under different market conditions;
4	To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues
5	To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;
6	To prepare and analyze various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Familiarize the elementary perspectives of economics
2	Acquaint the students about the concepts of demand, supply and general production theory related to economics
3	Apply business analysis to the firm under different market conditions
4	Apply economic models to examine current economic scenario and to solve the economic issues
5	Apply various economic tools for analyzing the projects and decision making process
6	Analyze the various economic tools like balance sheet, tax, forecasting, and international concepts like FDI, FPI, and FII

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1											3	
CO2	2										2	3
CO3	2										2	
CO4								3				2
CO5	3										2	
CO6	2										3	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO11	3	To know about the elementary principles in business economics helps them to understand the management as well as the business practices in economics
CO2	PO2	2	Simple kind of mathematical equations are used to identify the degree of elasticities related to demand and supply and production function
	PO11	2	With help of management and business practices students can analyze the changing patterns of demand, supply and production function
	PO12	3	The demand and supply functions are lifelong learning concepts
CO3	PO2	2	To analyze the market conditions of a firm, break even concepts is used. It is a mathematical concept.
	PO11	2	The marketing functions are highly correlated with the business practices and principles in economics
CO4	PO8	3	To analyze the current economic scenario it necessary to take into consider the social and legal procedures and programmed related to them
	PO12	2	Corrective action related to economic scenario helps the students to analyze the various economic conditions faced throughout their life
CO5	PO1	3	The decision making and evaluation of projects are based on different economic tools which are used mathematical and statistical equations.
	PO11	2	Some kind of decision making functions are based on the principles that is used in economics like risk, uncertainty etc
CO6	PO1	2	Mathematical tools are used to analyze the various economic tools. Eg, trend projection method, balance sheet
	PO12	3	These are helpful to students to identify the various opportunities in their life within the and outside the nation

CE231 CIVIL ENGINEERING DRAFTING LAB

Program: **Civil engineering**	Degree : **B-Tech**
Course **: Civil engineering drafting lab**	Course code**: CE231**
L-T-P**:0-0-3**	Credit**:1**

List of Exercises : (at least 10 exercises / plates are mandatory)

1. Paneled Doors
2. Glazed Windows and Ventilators in wood
3. Steel windows
4. Roof truss in steel sections
5. Reinforced concrete staircase
6. Residential buildings with flat roof
7. Residential buildings with tiled roof
8. Preparation of site plan and service plans as per building rules
9. Building Services (for single and two storied buildings only). Septic tanks and soak pit detailed drawing
10. Two storied and multi storied buildings
11. Public buildings like office, dispensary, post office, bank etc.
12. Industrial buildings with trusses

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To introduce the fundamentals of Civil Engineering drawing.
2	To understand the principles of planning
3	To learn drafting of buildings.
4	To impart knowledge on drafting software such as AutoCAD.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Introduce the fundamentals of Civil Engineering drawing.
2	Learn drafting of buildings.
3	Impart knowledge on drafting software such as AutoCAD.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	3		3	-	1
CO2	-	-	-	-	3	-	-	-	-	-	-	3		3	-	1
CO3	-	-	-	-	3	-	-	-	-	-	-	3		3	-	1

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Students can attain the knowledge and ability of drafting civil engineering drawings by means of analyzing the fundamentals.
	PO12	3	Students can attain the ability to engage in the broadest context of technological change and in other civil engineering practices by knowing the drafting of civil engineering drawings with short time.
CO2	PO5	3	Students can attain the ability of drafting civil engineering drawings.
	PO12	3	Students can attain the ability to engage in all civil engineering practices by experiencing of civil engineering drafting using computer aided designing software.
CO3	PO5	3	Students can create and apply appropriate techniques and innovations using Civil engineering drafting software like AutoCAD in the planning of civil engineering projects.
	PO12	3	Students can demonstrate knowledge and understanding of engineering and management principles using computer aided software and can apply these to one's own work, as a member and leader in a team.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates shall demonstrate knowledge in the planning and drafting of civil engineering projects.
	PSO3	1	Graduates will demonstrate ability to function within modern computer aided software and can apply it in own working practices for analyzing various civil engineering structures.
CO2	PSO1	3	Graduates shall demonstrate knowledge in the drafting of civil engineering projects with short period of time.
	PSO3	1	Graduates will demonstrate ability to function within modern computer aided software and can apply it in own working practices for analyzing various civil engineering structures.
CO3	PSO1	3	Graduates shall demonstrate knowledge in the drafting of civil engineering infrastructures using computer aided software like AutoCAD with short period of time.
	PSO3	1	Graduates will demonstrate ability to function within modern computer aided software AutoCAD and can apply it in own working practices.

CE231 SURVEYING LAB

Program: **Civil engineering**	Degree : **B-Tech**
Course **: Surveying**	Course code**: CE233**
L-T-P**:0-0-3**	Credit**:1**

List of Exercises : (at least 10 exercises / plates are mandatory)

1. Introduction to conventional surveying -1 class
2. Levelling (dumpy level) -2 class
3. Theodolite surveying (Theodolite) -3class
4. Total Station survey (Total Station) -5 class
   a. Heights and Distance
   b. Area computation
   c. Downloading
5. Study of instruments –Automatic level, digital level, Handheld GPS -2 class
6. Test -2 class

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To equip the students to undertake survey using tacheometer
2	To equip the students to undertake survey using total station
3	To impart awareness on distomat and handheld GPS

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain the concept of open traverse surveying and apply the same on the fields.
2	Generalize the concept of Levelling and apply it to find elevations of different points in the field by Collimation Method or Rise and Fall Method
3	Determine the angles by Method of Reiteration using Theodolite
4	Determine the angles by Method of Repetition using Theodolite.
5	Extend the meaning of slope distance, horizontal distance and vertical height and its measurement using a Total Station Instrument
6	Use resection or method of coordinate for the measurement of area using a Total Station Instrument

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2								2						2	1
CO2	2								2					3		1
CO3	2								2					3		1
CO4									2					1		
CO5					2				2					2		
CO6					1										2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Apply the knowledge of survey by the method of open traverse
	PO9	2	Function effectively as an individual, and as a member or leader in teams while doing open survey.
CO2	PO1	2	Apply the mathematical knowledge in computing the level difference by both rise and fall method and height of collimation method
	PO9	2	Function effectively as an individual, and as a member or leader in teams while doing levelling.
CO3	PO1	2	apply the knowledge in mathematics for determining the angles from theodolite by reiteration repetition method.
	PO9	2	Function effectively as an individual, and as a member or leader in teams while determining the angles from theodolite by reiteration
CO4	PO9	2	Function effectively as an individual, and as a member or leader in teams while determining angles from theodolite by repetition method
CO5	PO5	2	By using modern instruments like total station helps toto understand the meaning of slope distance,
	PO9	2	Function effectively as an individual, and as a member or leader in teams while determining slope distance .
CO6	PO5	1	By using modern instruments like total station helps to use resection or method of coordinate for the measurement of area using a Total Station Instrument.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO2**	**2**	The graduates of the program me are able understand the societal and safety factors involved while doing open traverse.
CO2	**PSO2**	**3**	Graduates will able to understand the environmental, societal and safety factors involved while doing leveling.
CO3	**PSO1**	**3**	The graduates of the program me are able understand the reiteration method
CO4	**PSO1**	**1**	The graduates of the program me are able understand the reiteration method
CO5	**PSO1**	**2**	The graduates of the program me are able understand the repetition method
CO6	**PSO1**	**2**	The graduates of the program me are able understand the method of coordinate for the measurement of area using a Total Station Instrument

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER IV

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

VISION

"Strive for excellence in generation and dissemination of knowledge."

MISSION

- To mould engineers of tomorrow, who are capable of addressing the problems of the nation and the world, by imparting technical education at par with international standards
- To instil a desire in students for research, innovation, invention and entrepreneurship
- To strive for creative partnership between the industry and the Institute
- To impart the values of environment awareness, professional ethics, societal commitment, life skills and a desire for lifelong learning

DEPARTMENT OF CIVIL ENGINEERING

VISION

To emerge as a department producing graduate professionals in Civil Engineering having quality, leadership and commitment to the profession by keeping stride with new changes and challenges

MISSION

- To create quality civil engineers with clear understanding of fundamentals of civil engineering subjects.
- To transform the students into highly competent and technologically efficient and creative professionals
- To inculcate among the students a feeling of societal commitment, ownership of profession and ethical values

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

The graduates from Civil Engineering program are expected to achieve the following Program Educational Objective within a few years of graduation

PEO1: Utilize the solid foundation in science and engineering basics to handle any civil engineering problems.

PEO2: Conversant in planning, designing, construction and maintenance of civil engineering structures for the wellbeing of society.

PEO3: Capable of developing the culture of lifelong learning through interaction during conferences, workshops and field visits.

PEO4: Prepared to face challenges in profession and attain positions of leadership in an organization and/or on teams.

PROGRAM OUTCOMES (PO):

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OBJECTIVES (PSO)

The **Civil Engineering** program graduates will be able to

PSO1: Demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.

PSO2: Have a broad understanding of economical, environmental, societal and safety factors involved in infrastructural development.

PSO3: Demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.

BL	**BLOOM'SLEVEL**		
L1	Level -1	Remenbering	Recalling from memory of previously learned material
L2	Level -2	Understanding	Explaining Ideas or Concepts
L3	Level -3	Applying	Using information in another familiar situation
L4	Level -4	Analyzing	Breaking information into part to explore understandings and relationships
L5	Level -5	Evaluating	Justify a decision or course of action
L6	Level -6	Creating	Generating new ideas, products or new ways of viewing

MA202 PROBABILITY DISTRIBUTIONS, TRANSFORMS AND NUMERICAL METHODS

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Probability distributions, transforms and numerical methods**	Course code**: MA 201**
L-T-P**: 3-1-0**	Credit**: 4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Discrete Probability Distributions Discrete Random Variables, Probability distribution function, Cumulative distribution function. Mean and Variance of Discrete Probability Distribution. Binomial Distribution-Mean and variance. Poisson Approximation to the Binomial Distribution. Poisson distribution-Mean and variance.	8	15 %
II	Continuous Probability Distributions. Continuous Random Variable, Probability density function, Cumulative density function, Mean and variance. Normal Distribution, Mean and variance (without proof). Uniform Distribution. Mean and variance. Exponential Distribution, Mean and variance.	10	15 %
III	Fourier Integrals and transforms. Fourier Integrals. Fourier integral theorem (without proof). Fourier Transform and inverse transform. Fourier Sine & Cosine Transform, inverse transform.	9	15 %
IV	Laplace transforms Laplace Transforms, linearity, first shifting Theorem. Transform of derivative and Integral, Inverse Laplace transform, Solution of ordinary	13	15 %

	differential equation using Laplace transform. Unit step function, second shifting theorem. Convolution Theorem (without proof). Differentiation and Integration of transforms.		
V	Numerical Techniques. Solution Of equations by Iteration, Newton- Raphson Method. Interpolation of Unequal intervals-Lagrange's Interpolation formula. Interpolation of Equal intervals-Newton's forward difference formula, Newton's Backward difference formula.	7	20 %
VI	Numerical Techniques. Solution to linear System- Gauss Elimination, Gauss Seidal Iteration Method. Numeric Integration-Trapezoidal Rule, Simpson's 1/3 Rule. Numerical solution of firstorder ODE-Euler method, Runge-Kutta Method (fourth order).	9	20 %

TEXT BOOKS:

1	Miller and Freund's "Probability and statistics for Engineers"-Pearson-Eighth Edition
2	Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley, 2015.

REFERENCES:

1	V. Sundarapandian, "Probability, Statistics and Queuing theory", PHI Learning, 2009.
2	C. Ray Wylie and Louis C. Barrett, "Advanced Engineering Mathematics"-Sixth Edition.
3	Jay L. Devore, "Probability and Statistics for Engineering and Science"-Eight Edition.
4	Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineers"-Sixth Edition-Mc Graw Hill.

PREREQUISITE: nil

COURSE OBJECTIVES:

1	To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in various Engineering and social life situations.
2	To know Laplace and Fourier transforms, that has wide applications in all Engineering courses.
3	To enable the students to solve various engineering problems using numerical methods.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	To have a concept of discrete probability density functions and probability distributions like Binomial Distribution and Poisson Distribution
2	To have a concept of continuous probability density functions and probability distributions like Normal, Uniform and Exponential distribution
3	To use Fourier integrals and Fourier transforms in solving various engineering problems
4	To understand the concept of Laplace and inverse Laplace transforms and apply them to solve ordinary differential equations
5	To use the iteration and interpolation methods to solve engineering problems
6	To use the concept of numerical methods and their applications to solve linear systems and first order ODE'

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	3	2					
CO2	3	3	3	2	2	3	2					
CO3	3		3	3	3							

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Students use the knowledge in data analysis
	PO2	3	Helps students to Check for the possibilities
	PO3	3	Helps students to conclude from data distribution
	PO4	2	Help students in interpreting the
	PO5	2	Students would be able to predict from the statistical analysis of the data
	PO6	3	Help students to analyze the population interests
	PO7	2	Help students in taking safety measures by past data analysis
CO2	PO1	3	Students use the knowledge in data analysis
	PO2	3	Helps students to Check for the possibilities
	PO3	3	Helps students to conclude from data distribution
	PO4	2	Help students in interpreting the
	PO5	2	students would be able to predict from the statistical analysis of the data
	PO6	3	Help students to analyze the population interests
	PO7	2	Help students in taking safety measures by past data analysis
CO3	PO1	3	Help students in using in signals and image processing
	PO3	3	Help students in using compression and decompression of signals
	PO4	3	Help students to solve some complex mathematics problems
	PO5	3	Like FFT, students can use in communication systems
CO4	PO1	2	Help students in solving the differential equations
	PO3	2	Help students in using in data interpolation
CO5	PO1	3	Help students Analysing the data from interpolation
	PO3	3	Help students to provide valid conclusion using the approximation methods
CO6	PO1	2	Help students in solving complex integration and differential equations

	PO3	2	Help students to provide valid conclusion using the approximation methods

CE202 STRUCTURAL ANALYSIS

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Structural Analysis I**	Course code**: CE 201**
L-T-P**:** **3-1-0**	Credit**:** **4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	**Truss analysis**: Analysis of determinate truss-Methods of joints and sections (Numerical problems) Elastic theorems and energy principles - strain energy due to axial load, bending moment, shear and torsion - strain energy method, Castigliano's method for deflection (Derivations only)	8	15 %
II	Principle of virtual work – Unit load method-Betti's theorem –Maxwell's law of reciprocal deflections - principle of least work -application of unit load method and strain energy method for determination of deflection of statically determinate beams, frames - pin jointed trusses (simple numerical problems) Concepts of temperature effects and lack of fit.(No numerical problems) Statically indeterminate structures: Degree of static and kinematic indeterminacies – Introduction to force and displacement method(step by step procedure)	9	15 %
III	**Strain Energy methods**: Analysis of beams, frames and trusses with internal and external redundancy – (Simple problems with maximum two redundants) Concepts of effect of prestrain, lack of	9	15 %

	fit, temperature changes and support settlement.(No numerical problems) **Method of Consistent deformations:** Analysis of beams frames and trusses with internal and external redundancy(Simple problems with maximum two redundants) Concepts of effect of prestrain, lack of fit, temperature changes and support settlement.(No numerical problems)		
IV	**Moving loads and influence lines**. Introduction to moving loads - concept of influence lines – influence lines for reaction, shear force and bending moment in simply supported beams and over hanging beams - analysis for different types of moving loads - single concentrated load – several concentrated loads, uniformly distributed load on shorter and longer than the span.	10	15 %
V	**Cables:** Analysis of forces in cables under concentrated and uniformly distributed loads - Anchor Cables **Suspension Bridges :** Un-stiffened suspension bridges, maximum tension in the suspension cable and backstays, pressure on towers.	10	20 %
VI	**Arches** : Theory of arches - Eddy‟s theorem - analysis of three hinged arches-Support reactions-normal thrust and Radial shear at any section of a parabolic and segmental arch due to simple cases of loading. Moving loads on three hinged arches (simple problems)	10	20 %

TEXT BOOKS:

1	Gere and Timoshenko, Mechanics of materials, CBS. Publishers

2	Kenneth Leet,Chia M Uang& Anne M Gilbert., Fundamentals of Structural Analysis, McGraw Hill
3	R.Vaidyanathan and P.Perumal, Comprehensive Structural Analysis Volume I & II, Laxmi Publications (P) Ltd
4	Wang C.K., Intermediate Structural Analysis, McGraw Hill

REFERENCES:

1	Aslam Kassimali., Structural Analysis, Cenage Learning
2	Chandramouli P N, Structural Analysis I –Analysis of Statically Determinate Structures, Yes DeePublishing Pvt Ltd.,Chennai,Tamil Nadu.
3	DevdasMenon, Structural Analysis, Narosa Publications
4	Hibbeler., Structural Analysis, Pearson Education
5	Kinney S., Indeterminate Structural Analysis, Oxford & IBH
6	M.L. Gambhir, Fundamentals of structural Mechanics and analysis, Printice Hall India
7	Reddy C.S., Indeterminate Structural Analysis, Tata McGraw Hill
8	Timoshenko S.P.& Young D.H., Theory of Structures, McGraw Hill

PREREQUISITE: CE201 Mechanics of Solids

COURSE OBJECTIVES

1	To equip the students with the comprehensive methods of structural analysis with emphasis on analysis of elementary structures.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Analyse trusses and study displacement response of statically determinate structural systems using energy methods:
2	Apply unit load method and strain energy method for determination of deflection of statically determinate beams, frames & pin jointed trusses and to distinguish between statically
3	Analyse statically indeterminate structures using strain energy method and method of consistent deformation
4	Analyse statically indeterminate structures using strain energy method and method of

	determinate and indeterminate structures and methods to solve statically indeterminate structures.

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO 1	2	3												3		
CO 2		2												3		
CO 3	2	3												3		
CO 4	1	3												2		
CO 5	2	3												3	1	
CO 6	2	3												3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Apply the knowledge of mathematics and engineering fundamentals to study the displacement response of statically determinate structural systems using energy methods
	PO2	3	Analyze the trusses using first principles of mathematics and engineering sciences.
CO2	PO2	2	Apply the basic knowledge of unit load method and strain energy method for determination of deflection of statically determinate structures.
CO3	PO1	2	Identify statically indeterminate structures by using knowledge fundamental mathematics.
	PO2	3	Analyze indeterminate structure using strain energy method and consistent deformation method
CO4	PO1	1	Identify the influence of reaction, shear force and bending moment in beams using knowledge of engineering fundamentals
	PO2	3	Formulate and analyze the different types of moving loads for various types of loads.

CO5	**PO1**	**2**	Identify statically determinate and indeterminate suspension bridges and cables by applying knowledge of engineering fundamentals.
	PO2	**3**	Formulate and analyze the different types of cables and suspension bridges.
CO6	**PO1**	**2**	Identify statically determinate and indeterminate arches by applying knowledge of engineering fundamentals.
	PO2	**3**	Formulate and analyze the different types of arches.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	The graduates of the programme are able to analyze truss and have sound knowledge in elastic theorems and energy method
CO2	**PSO1**	**3**	Graduates will apply the knowledge of principles of virtual work for understanding the structure behavior
CO3	**PSO1**	**3**	Graduates will apply different methods to identify and analyze different type of structures
CO4	**PSO1**	**2**	Graduates will apply influence line method for analysis of moving loads in various infrastructural elements.
CO5	**PSO1**	**3**	By applying learnt knowledge the graduates of the programme are able to analyze cables and suspension bridges.
	PSO2	**1**	Graduates are capable of understanding the economical aspects for having a good infrastructure.
CO6	**PSO1**	**3**	By applying learnt knowledge the graduates of the programme are able to analyze arches.

CE204 CONSTRUCTION TECHNOLOGY

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**

Course: **Construction Technology**	Course code: **CE204**
L-T-P: **4-0-0**	Credit: **4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Properties of masonry materials – review of specifications; **Mortar** – Types – Sand – properties – uses. **Timber products**: properties and uses of plywood, fibre board, particle board. **Iron and Steel** –Reinforcing steel – types – specifications. **Structural steel** – specifications **Miscellaneous materials** (only properties, classifications and their use in construction industry): Glass, Plastics, A.C. Sheets, Bitumen, Adhesives, Aluminium	9	15 %
II	**Concrete** – Aggregates – Mechanical & Physical properties and tests – Grading requirements – Water quality for concrete – **Admixtures** – types and uses – plasticizers – accelerators – retarders –water reducing agents **Making of concrete** - batching – mixing – types of mixers – transportation – placing – compacting – curing **Properties of concrete** – fresh concrete – workability – segregation and bleeding - factors affecting workability & strength – tests on workability – tests for strength of concrete in compression, tension & flexure **Concrete quality control** – statistical analysis of results – standard deviation –acceptance criteria – mix proportioning (B.I.S method) – nominal mixes.	9	15 %
III	**Building construction** - Preliminary considerations for shallow and deep foundations **Masonry** – Types of stone masonry – composite walls - cavity walls and partition walls -Construction details and features – scaffoldings **Introduction to Cost-effective**	9	15 %

	construction - principles of filler slab and rat-trap bond masonry		
IV	**Lintels and arches** – types and construction details. **Floors and flooring** – different types of floors and floor coverings **Roofs and roof coverings** – different types of roofs – suitability – types and uses of roofing materials **Doors, windows and ventilators** – Types and construction details **Finishing works** – Plastering, pointing, white washing, colour washing, distempering, painting. Methods of providing DPC. Termite proofing	9	20 %
V	**Tall Buildings** – Framed building – steel and concrete frame – structural systems –erection of steel work–concrete framed construction– formwork – construction and expansion. Joints Introduction to prefabricated construction – slip form construction **Vertical transportation:** Stairs – types - layout and planning- **Elevators** – types – terminology – passenger, service and goods elevators – handling capacity - arrangement and positioning of lifts – **Escalators** – features –use of ramps	10	20 %
VI	**Building failures** – General reasons – classification – Causes of failures in RCC and Steel structures, Failure due to Fire, Wind and Earthquakes. **Foundation failure** – failures by alteration, improper maintenance, overloading. Retrofitting of structural components - beams, columns and slabs	10	20%

TEXT BOOKS:

1	Arora and Bindra, Building construction, Dhanpath Rai and Sons.

2	Punmia B. C, Building construction. Laxmi Publications
3	Rangwala S C., Engineering Materials, Charotar Publishers
4	Shetty M.S., Concrete Technology, S. Chand & company.

REFERENCES:

1	Adler R, Vertical Transportation for Building, American Elsevier Pub.
2	G C Sahu & Joygopal Jena., Building Materials and construction, McGraw Hill Education
3	Gambhir M L, Concrete Technology, Tata McGrawHill.
4	Krishna Raju N, Design of Concrete Mixes, CBS publishers.
5	Mcking T.M, Building Failures, Applied Science Pub.
6	Neville A.M. and Brooks.J.J, Concrete Technology, Pearson Education.
7	Smith P & Julian W. Building services, Applied Science Pub.
8	Tall building systems & concepts, Monograph on planning and design of Tall building,

PREREQUISITE: nil

COURSE OBJECTIVES

1	To study details regarding the construction of building components
2	To study properties of concrete and concrete mix design
3	To impart the basic concepts in functional requirements of building and building services.
4	To develop understanding about framed construction and building failures

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Describe about different construction materials, components and their manufacturing process.
2	Describe the properties of concrete and their different mix design methods
3	State the details regarding the construction of building components, foundations and cost effective constructions.

4	Recall type construction details of various building components
5	Count structure, servicing and construction details of tall buildings.
6	Count structure, servicing and construction details of tall buildings.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1							3							3		
CO2			2				2							3	2	
CO3							2							3		
CO4											1	2		3		
CO5				2											2	
CO6	2						2							2	3	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO7**	**3**	Able to understand construction materials and components
CO2	**PO3**	**2**	Knowledge regarding properties of concrete and their different mix design methods.
	PO7	**2**	Different mix design and methods for environmental friendly and sustainable development
CO3	**PO7**	**2**	Knowledge regarding construction of building components
CO4	**PO11**	**1**	Able to demonstrate and understand Functional and service requirements of domestic building
	PO12	**3**	Able to understand Functional and service requirements of domestic building.
CO5	**PO4**	**2**	Brief knowledge about tall framed constructions
CO6	**PO1**	**2**	Knowledge regarding building and foundation failures
	PO7	**2**	Brief knowledge regarding retrofitting

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION

CO1	PSO1	3	The graduates of the program are able to understand various construction components and aspects
CO2	PSO1	3	The graduates of the program are able to do get a sound knowledge regarding various mix design methods
	PSO2	2	The graduates of the program are able to do mix design.
CO3	PSO1	3	The graduates of the program are able to have a sound knowledge regarding the construction of building components
CO4	PSO1	3	The graduates of the program are able to aanalyse and apply learning of construction materials, structure.
CO5	PSO2	2	The graduates of the program are able to do design criteria of tall framed and load bearing buildings and structures.
CO6	PSO1	2	The graduates of the program have sound knowledge in civil engineering aspects such as foundation and failures
	PSO2	3	The graduates of the program have broad understanding about retrofitting of building and infrastructural development

CE206 FLUID MECHANICS II

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Fluid Mechanics II**	Course code**: CE 206**
L-T-P**:** **3-0-0**	Credit**:** **3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Hydraulic Machines - Impulse momentum principle, impact of jets, force of a jet on fixed and moving vanes. Turbines- classification and comparison of velocity triangles for Pelton wheel and reaction turbines (Francis and Kaplan), work done and efficiency, specific speed, draft tube- different types, penstock, surge tank - types, cavitation in turbines (Concepts only).	7	15 %
II	Pumps- classification of pumps - Centrifugal pumps- types, work done, efficiency, minimum speed, velocity triangle for pumps, specific speed, priming, limitation of suction lift, net positive suction head, cavitation in centrifugal pump (Concepts only).	7	15 %
III	Introduction : Open channel flow and its relevance in Civil Engineering , Comparison of open channel flow and pipe flow . Flow in open channels-types of channels, types of flow, geometric elements of channel section, velocity distribution in open channels, uniform flow in channels, Chezy's equation, Kutter's and Manning's formula, Most economic section for rectangular and trapezoidal channels. Condition for maximum discharge and maximum velocity through circular channels, computations for uniform flow, normal depth, conveyance of a channel section, section factor for uniform flow.	6	15 %
IV	Specific energy, critical depth, discharge diagram, Computation of critical flow, Section factor for critical flow. Specific force, conjugate or sequent depths, hydraulic	6	15 %

	jump, expression for sequent depths and energy loss for a hydraulic jump in horizontal rectangular channels, types of jump, length of jump, height of jump, uses of hydraulic jump.		
V	Gradually varied flow - dynamic equation for gradually varied flow, different forms of dynamic equation, Approximation for a wide rectangular channel, classification of surface profiles, Backwater and drawdown curves, characteristics of surface profiles in prismatic (Rectangular and trapezoidal only). Computation of length of surface profiles, direct step method. Design of lined open channels : trapezoidal cross-sections only	8	20 %
VI	Dimensional analysis and model studies - dimensions, dimensional homogeneity, methods of dimensional analysis, Rayleigh method, Buckingham method, dimensionless numbers, Similitude - geometric, kinematic and dynamic similarities. Model laws - Reynold's and Froude model laws, scale ratios, types of models, Concepts of distorted and undistorted models.	8	20 %

TEXT BOOKS:

1	Kumar D.S., Fluid Mechanics and Fluid power Engineering, S. K. Kataria & Sons, New Delhi, 2013
2	Modi P. N. and S. M. Seth, Hydraulics and Fluid Mechanics (Including Hydraulic Machines), Standard Book House, New Delhi, 2013.
3	Narayana Pillai,N. Principles of Fluid Mechanics and Fluid Machines, University Press, 2011.

REFERENCES:

1	Arora.K.R. Fluid Mechanics, Hydraulics and Hydraulic Machines, Standard Publishers, 2005.

2	Bansal R. K., A Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi Publications, 2010.
3	C S P Ojha, P N Chandramouli and R Brendtsson, Fluid Mechanics and Machinery, Oxford University Press , India , New Delhi
4	Hanif Choudhary, Open channel flow, Prentice Hall, 2010
5	Jain A. K., Fluid Mechanics, Khanna Publishers, Delhi, 1996.
6	Subramanya K., Open Channel Hydraulics, Tata McGraw Hill, 2009.
7	Ven Te Chow, Open channel Hydraulics, 2009.

PREREQUISITE: CE203 Fluid Mechanics I

COURSE OBJECTIVES

1	To study the Basic principles and laws governing fluid flow to open channel flow including hydraulic jump & gradually varied flow.
2	To understand basic modeling laws in fluid mechanics and dimensional analysis.
3	To apply the fundamental theories of fluid mechanics for the analysis and design of hydraulic machines

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Analyze turbines for the given data, and to know their operation characteristics under different operating conditions
2	Analyze pumps for the given data, and to know their operation characteristics under different operating conditions
3	Analyze open channels of various cross sections including economical channel sections
4	Apply energy concepts to flow in open channel sections, Calculate energy dissipation.
5	Analyze gradually varying flow and compute water profile at different conditions
6	Apply dimensional analysis to develop mathematical modeling and compute the parametric values in prototype by analyzing the corresponding model parameters

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2												3		
CO2	3	3												3		
CO3	3	3												2		
CO4	3	2												3		
CO5	3	3												2		
CO6	3	3												3		

CO-PO MAPPING JUSTIFICATION:

	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of analysis of turbines.
	PO2	2	The students will be able to identify, formulate and review research literature and analyse complex engineering problems in designing the tension members and beams using first principles of mathematics, natural sciences, and engineering sciences
CO2	PO1	2	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of analysis of pumps
	PO2	3	The students will be able to identify, formulate and review research literature and analyse complex engineering problems in analysis pumps and its components using natural sciences, and engineering sciences
CO3	PO1	3	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals to solve problems related to open channels
	PO2	3	The students will be able to identify, formulate and review research literature and analyse complex engineering problems in designing open channels using first principles of mathematics, natural sciences, and engineering sciences
CO4	PO1	3	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals for solving the concept of specific energy and its related topics

	PO2	2	The students will be able to identify, formulate and review research literature and analyse complex engineering problems in assessing the concept of specific energy and its applications using first principles of mathematics, natural sciences, and engineering sciences
CO5	PO1	3	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of gradually varied flow
	PO2	3	The students will be able to identify, formulate and review research literature and analyse complex engineering problems in assessing the nature of gradually varying flow using first principles of mathematics, natural sciences, and engineering sciences
CO6	PO1	3	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of problems related with dimensional analysis
	PO2	3	The students will be able to identify, formulate and review research literature and analyze complex engineering problems in developing mathematical models with the help of dimensional analysis using first principles of mathematics, natural sciences, and engineering sciences

CO-PSO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Completion of this course will help students analyze hydraulic turbines and its characteristics
CO2	PSO2	3	This course make students to analyze pumps for given operational conditions and to assess its performance
CO3	PSO1	2	Successful completion of this course will help students to design an open channel along with the idea of most economical section
CO4	PSO1	3	Completion of this course will help students use the idea of specific energy to evaluate flow characteristics in open channel

CO5	PSO1	3	Completion of this course will help students understand the nature of gradually varying flow and its applications in the field of civil engineering
CO6	PSO1	2	Completion of this course will help make mathematical models with the help of dimensional analysis techniques

CE208 GEOTECHNICAL ENGINEERING I

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**

Course: **Geotechnical Engineering**	Course code: **CE 208**
L-T-P: **3-0-0**	Credit: **3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction to soil mechanics -Major soil deposits of India Basic soil properties - Void ratio, porosity, degree of saturation, air content, percentage air voids, moisture content, specific gravity, unit weight - Relationship between basic soil properties – Sensitivity – Thixotropy - numerical problems	6	15 %
II	Index properties - Sieve analysis – Well graded, poorly graded and gap graded soils - Stoke's law - Hydrometer analysis (no derivation required for percentage finer and diameter) - numerical problems- – Relative density Consistency-Atterberg Limits - Practical Applications - numerical problems I.S. classification of soils.	6	15 %
III	Permeability of soils - Darcy's law – Factors affecting permeability - Practical Applications - Constant head and falling head permeability tests - Average permeability of stratified deposits (no derivation required) – numerical problems. Principle of effective stress - Total, neutral and effective stress variation diagrams - Quick sand condition - Critical hydraulic gradient - - numerical problems– Definition of phreatic line and exit gradient.	7	15 %
IV	Shear strength of soils- Practical Applications - Mohr-Coulomb failure criterion – Mohr circle method for determination of principal planes and stresses- numerical problems – relationship between shear parameters and principal stresses [no derivation required]	7	15 %

	Brief discussion of direct shear test, tri-axial compression test, vane shear test and unconfined compression test – Applicability - numerical problems -UU and CD tests [Brief discussion only]		
V	Compressibility and Consolidation - Void ratio versus pressure relationship - Coefficient of compressibility and volume compressibility – Compression index Practical Applications - Change in void ratio method - Height of solids method - Normally consolidated, under consolidated and over consolidated states - Estimation of pre consolidation pressure - Practical Applications - Estimation of magnitude of settlement of normally consolidated clays – Numerical problems Terzaghi's theory of one-dimensional consolidation(no derivation required) - average degree of consolidation – Time factor - Coefficient of consolidation - Practical Applications - Square root of time and logarithm of time fitting methods - Numerical problems	8	20 %
VI	Stability of finite slopes - Toe failure, base failure, slip failure - Swedish Circle Method- Friction circle method- Factor of safety with respect to cohesion and angle of internal friction - Stability number - Stability charts. Compaction of soils - Standard Proctor, Modified Proctor, I.S. light & Heavy Compaction Tests – OMC - Zero Air voids line - Control of compaction - numerical problems	8	20 %

TEXT BOOKS:

1	Das B. M., Principles of Geotechnical Engineering, Cengage India Pvt. Ltd., 2010.
2	Ranjan G. and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age International, 2002.

REFERENCES:

1	A V Narasimha Rao and C Venkatramaiah, Numerical Problems, Examples and Objective questions in Geotechnical Engineering, Universities Press (India) Ltd., 2000
2	Arora K. R., Geotechnical Engineering, Standard Publishers, 2006.
3	Purushothamaraj P., Soil Mechanics and Foundation Engineering, Dorling Kindersley(India) Pvt. Ltd., 2013
4	Taylor D.W., Fundamentals of Soil Mechanics, Asia Publishing House, 1948.
5	Terzaghi K. and R. B. Peck, Soil Mechanics in Engineering Practice, John Wiley, 1967.
6	Venkatramaiah, Geotechnical Engg, Universities Press, 2000.

PREREQUISITE: CE 205 Engineering Geology

COURSE OBJECTIVES

1	To impart to the fundamentals of Soil Mechanics principles
2	To provide knowledge about the basic, index and engineering properties of soils.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Describe the basic principles governing soil behavior and determine the relationship between basic soil properties
2	Identify the procedure to determine the index properties of any type of soil, classify the soil based on its index properties
3	Assess permeability property of soils and acquires conceptual knowledge about effective stress
4	Estimate shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory
5	Compute the compressibility behavior of soils
6	Analyze finite slopes using different methods

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**	**3**												**3**		
CO2	**3**	**2**												**3**		
CO3	**3**	**3**				**1**	**1**							**3**	**1**	
CO4	**2**	**3**												**3**		
CO5	**3**	**3**				**1**	**1**							**3**	**1**	
CO6	**3**	**2**				**1**								**3**	**1**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Relationship between the basic soil properties is essential to understand the behaviour of any type of soil
	PO2	**3**	Knowledge about the soil properties can be used to solve complex geotechnical problems
CO2	**PO1**	**3**	Determination of index properties of soils will help the student to identify and classify any different types of soils
	PO2	**2**	Conducting experiments to determine index properties and to arrive conclusions will be helpful in characterization of soils
CO3	**PO1**	**3**	Conceptual knowledge about the permeability and effective stress will help the student to understand the behavior of soils under seepage
	PO2	**3**	Knowledge about permeability characteristics is helpful to solve complex problems and there by suggest any soil improvement techniques
	PO6	**1**	Students can suggest an economical ground improvement technique to modify the permeability characteristics of soil and there by solve many field problems
	PO7	**1**	seepage of water through base of foundation can be analysed and can propose a safe and efficient hydraulic structures such as dams, in society

CO4	**PO1**	**2**	Basic understanding about the shear strength of soil is useful to determine capacity of soil
	PO2	**3**	Using shear strength parameters and Mohr – Coulomb failure theory shear strength problems can be evaluated and suggest suitable measures to improve shear strength
CO5	**PO1**	**3**	Knowledge about compressibility behavior of soil is essential to identify compaction characteristics of soil and apply that knowledge to assess field compaction procedures
	PO2	**3**	Solve practical problems related to estimation of consolidation settlement of soil deposits and time required for the same
	PO6	**1**	Practical knowledge about compressibility of soils is useful to select appropriate soil improvement technique and thereby support development of constructions
	PO7	**1**	Environmental friendly ground improvement techniques can improve bearing capacity of soil
CO6	**PO1**	**3**	Basic knowledge regarding finite slopes will be helpful to understand behavior of slopes
	PO2	**2**	Stability of slopes can be analysed by using different methods such as Swedish circle method and friction circle method and any improvements can be suggested incase of unstable slopes
	PO6	**1**	Preventive measures for environmental problems such as slope failures and landslides can be suggested

CO-PSO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	graduates will have knowledge in basic behaviour of soils
CO2	**PSO1**	**3**	Graduates will be able to identify and classify the given soil and reach some conclusions by conducting experiments
CO3	**PSO1**	**3**	Graduates will have a thorough knowledge about permeability characteristics
	PSO2	**1**	Graduates will have an understanding of economical, environmental ground improvement techniques for development of infrastructure

CO4	**PSO1**	**3**	Graduates will have a thorough knowledge about shear strength of soil
CO5	**PSO1**	**3**	graduates will have a thorough knowledge about compaction and consolidation behaviour of soil
	PSO2	**1**	Graduates will have an understanding of economical, environmental ground improvement techniques for development of infrastructure
CO6	**PSO1**	**3**	Graduates will have a thorough knowledge about stability of finite slopes
	PSO2	**1**	Graduates will have an understanding of economical, environmental ground improvement techniques to prevent slope failures and land slides

HS210 LIFE SKILLS

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Life Skills**	Course code**: HS210**
L-T-P**: 2-0-2**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS L-P
I	Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures, Listening as an active skill; Types of Listeners; Listening for general content; Listening to fill up information; Intensive Listening; Listening for specific information; Developing effective listening skills; Barriers to effective listening skills. Technical Writing: Differences between technical and literary style, Elements of style; Common Errors, Letter Writing: Formal, informal and demi-official letters; business letters, Job Application: Cover letter, Differences between bio-data, CV and Resume, Report Writing: Basics of Report Writing; Structure of a report; Types of reports. Non-verbal Communication and Body Language: Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language Interview Skills: Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions, Presentation Skills: Oral presentation and public speaking skills; business presentations, Technology-based	5-10

	Communication: Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.	
II	Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.	4-4
III	Introduction to Groups and Teams, Team Composition, Managing Team Performance, Importance of Group, Stages of Group, Group Cycle, Group thinking, getting acquainted, Clarifying expectations. Group Problem Solving, Achieving Group Consensus. Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building & Managing Successful Virtual Teams. Managing Team Performance & Managing Conflict in Teams. Working Together in Teams, Team Decision-Making, Team Culture & Power, Team Leader Development.	6-4
IV	Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence,	12-4

	Character Spirituality, Senses of 'Engineering Ethics', variety of moral issued, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories. Engineering as experimentation, engineers as responsible experimenters, Codes of ethics, Balanced outlook on. The challenger case study, Multinational corporations, Environmental ethics, computer ethics, Weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.	
V	Introduction, a framework for considering leadership, entrepreneurial and moral leadership, vision, people selection and development, cultural dimensions of leadership, style, followers, crises. Growing as a leader, turnaround leadership, gaining control, trust, managing diverse stakeholders, crisis management Implications of national culture and multicultural leadership Types of Leadership, Leadership Traits. Leadership Styles, VUCA Leadership, DART Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders, making of a Leader, Formulate Leadership	6-4

EVALUATION SCHEME

Evaluation scheme

Internal Evaluation
(Conducted by the College)

Total Marks: 100

Part – A

(To be started after completion of Module 1 and to be completed by 30th working day of the semester)
1. Group Discussion – Create groups of about 10 students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation is as follows;
(i) Communication Skills – 10 marks
(ii) Subject Clarity – 10 marks
(iii) Group Dynamics - 10 marks
(iv) Behaviors & Mannerisms - 10 marks

(Marks: 40)

Part – B

(To be started from 31st working day and to be completed before 60th working day of the semester)
2. Presentation Skills – Identify a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation is as follows;
(i) Communication Skills* - 10 marks
(ii) Platform Skills** - 10 marks
(iii) Subject Clarity/Knowledge - 10 marks

(Marks: 30)

* Language fluency, auditability, voice modulation, rate of speech, listening, summarizes key learnings etc.
** Postures/Gestures, Smiles/Expressions, Movements, usage of floor area etc.

Part – C

(To be conducted before the termination of semester)

3. Sample Letter writing or report writing following the guidelines and procedures. Parameters to be used for evaluation is as follows;
(i) Usage of English & Grammar - 10 marks
(ii) Following the format - 10 marks
(iii) Content clarity - 10 marks

(Marks: 30)

External Evaluation
(Conducted by the University)

Total Marks: 50 Time: 2 hrs.

Part – A

Short Answer questions

There will be one question from each area (five questions in total). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows;

(i) Content Clarity/Subject Knowledge
(ii) Presentation style
(iii) Organization of content

Part – B

Case Study
The students will be given a case study with questions at the end the students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows;
(i) Analyze the case situation
(ii) Key players/characters of the case
(iii) Identification of the problem (both major & minor if exists)
(iv) Bring out alternatives
(v) Analyze each alternative against the problem
(vi) Choose the best alternative
(vii) Implement as solution
(viii) Conclusion
(ix) Answer the question at the end of the case

(Marks: 1 x 20 = 20)

RESOURCE BOOK:

1	Life Skills for Engineers, Complied by ICT Academy of Kerala, McGraw Hill Education (India) Private Ltd., 2016

REFERENCES:

1	Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxford Publishers.
2	Kalyana; (2015) "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd.
3	Larry James (2016); "The First Book of Life Skills"; First Edition; Embassy Books.
4	Shalini Verma (2014); "Development of Life Skills and Professional Practice"; First Edition; Sultan Chand (G/L) & Company
5	John C. Maxwell (2014); "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc.

PREREQUISITE: nil

COURSE OBJECTIVES

1	To develop communication competence in prospective engineers.
2	To enable them to convey thoughts and ideas with clarity and focus.
3	To develop report writing skills.
4	To equip them to face interview & Group Discussion.
5	To inculcate critical thinking process.
6	To prepare them on problem solving skills.
7	To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
8	To understand team dynamics & effectiveness.
9	To create an awareness on Engineering Ethics and Human Values.
10	To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
11	To learn leadership qualities and practice them.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Students will be able to realize the important factors involved in verbal/non-verbal communication in a professional context
2	Students will be_able to_apply creative and critical thinking while approaching different types of problems
3	Students should be able to become an adaptable team member as well as a leader who could successfully manage any team/group
4	Students in future would become a professional who has inculcated integrity , values , ethics and realize his/her commitment to the society
5	Students will realize the factors involved in the growth of an effective leader and become one in the future
1	Students will be able to realize the important factors involved in verbal/non-verbal communication in a professional context

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1							3					
CO2		1										
CO3						3						
CO4								3	3	1	1	
CO5						3						

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO7**		Students must be able to communicate with clients and colleagues alike through effective communication platforms like group discussion, debate, interviews, presentation with suitable kinesics, proxemics and chronemics.
CO2	**PO2**		Students should be able to apply their creative and critical thought process to solve complex problems.
CO3	**PO6**		Students are familiarized with the stages of group formation , types of groups and teams , their differences, team performance management and group problem solving methods.
CO4	**PO8**		Students are familiarized with many case studies which effectively conveys the role of an engineer in a society and the paramount importance of public. health and safety an engineer should be concerned with
	PO9		Students should not ignore the importance of ethics and morality as professionals.
	PO10		Environmental ethics ,computer ethics professional ethics professed by certain professional associations are to be familiarized by students.
	PO11		Students must understand the theory of moral development as well as the responsibilities of an engineer as a manager, expert witness and consulting engineer.
CO5	**PO6**		Different leadership styles based on different contexts and the growing stages of a leader must be familiarized by the students.

CE232 MATERIAL TESTING LAB

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Material Testing Lab**	Course code**: CE 232**
L-T-P**:** **0-0-3**	Credit**:** **1**

CONTENTS

List of Experiments: (10 Experiments mandatory)

1. Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars) (Universal Testing machine and suitable extensometer)
2. Shear test on mild steel rod (Compression Testing Machine and Shear Shackle)
3. Bending test on mild steel (I sections) (Universal Testing Machine)
4. Torsion test on Mild steel circular bars (Torsion Testing Machine)
5. Torsion test on Steel/Copper/ Aluminum wires
   a. Using Torsion Pendulum with Central disk
   b. Using Torsion Pendulum with distributed Mass
6. Impact test
   a. Izod test (Impact Testing Machine)
   b. Charpy test (Impact Testing Machine)
7. Hardness test
   a. Brinell Hardness test (Brinnel Hardenss Testing Machine)
   b. Rockwell Hardness test (Rockwell Hardness Testing Machine)
   c. Vickers Hardness test (Vickers Hardness Testing Machine)
8. Test On Springs
   a. Open coil (Spring Testing Machine)
   b. Close coil (Spring Testing Machine)
9. Bending Test on Timber (Universal Testing Machine and dial Gauge)
10. Bend & Rebend test on M S Rods
11. Verification of Clerk Maxwells Theorem
12. Demonstration of Fatigue Test
13. Study/demonstration of Strain Gauges and load cells

PREREQUISITE: nil

COURSE OBJECTIVE

1	This course provides students opportunities to become familiar with standard mechanical testing methods and fundamental properties of engineering materials

COURSE OUTCOMES:

After successful completion of the course, the students should be able to

CO's	DESCRIPTION
1	Measure tensile and compressive strength of a specimen for applying in a practical design based project work
2	Determine hardness, impact strength, fatigue strength to analyze the application of a specific material for a given design requirements for different loading conditions of structures
3	Judge the capacity of a material to withstand torsional stresses for a safe and sustainable design of machine elements

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**			**3**										**3**		
CO2	**3**			**3**										**3**		
CO3	**3**			**3**										**3**		

CO-PO MAPPING JUSTIFICATION

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of engineering fundamentals to find the desired material property
	PO4	**3**	Conduct investigation on engineering materials
CO2	**PO1**	**3**	Apply the knowledge of engineering fundamentals to find the desired material property
	PO4	**3**	Conduct investigation on engineering materials
CO3	**PO1**	**3**	Apply the knowledge of engineering fundamentals to find the desired material property

PO4	**3**	Conduct investigation on engineering materials

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	The graduates of the programme will sound knowledge in laboratory investigations
CO2	**PSO1**	**3**	The graduates of the programme will sound knowledge in laboratory investigations
CO3	**PSO1**	**3**	The graduates of the programme will sound knowledge in laboratory investigations

CE234 FLUID MECHANICS LAB

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Material Testing Lab**	Course code**: CE 232**
L-T-P**:** **0-0-3**	Credit**:** **1**

CONTENT

List of Experiments (Minimum 12 nos. mandatory)

1. Study of taps, valves, pipe fittings, gauges, pitot tubes, water meters and current meters.

2. Calibration of Pressure gauges

3. Determination of metacentric height and radius of gyration of floating bodies.

4. Verification of Bernoulli's theorem

5. Hydraulic coefficients of orifices and mouth pieces under constant head method and time of emptying method.

6. Calibration of Venturimeter.

7. Calibration of Orifice meter

8. Calibration of water meter.

9. Calibration of rectangular and triangular notches.

10. Time of Emptying : unsteady flow

11. Determination of Darcy's and Chezy's constant for pipe flow.

12. Determination of Chezy's constant and Manning's number for open channel flow.

13. Plotting Specific Energy Curves in Open Channel flow

14. Study of Parameters of Hydraulic Jump in Open channel Flow.

15. Determination of friction co-efficient in pipes

16. Determination of loss co-efficient for pipe fittings

PREREQUISITE: CE203 Fluid Mechanics- I

COURSE OBJECTIVES

1	Students should be able to verify the principles studied in theory by performing the experiments in laboratory

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Apply the fundamental principles of fluid mechanics in calculations involving basic flow measuring devices in closed and open channel flows.
2	Apply the fundamental principles of fluid mechanics and analyse the energy loss in open channel flow.
3	Predict the stability of a floating vessel following the principles of metacentric height and radius of gyration

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		PSO 1	PSO 2	PSO 3
CO 1	3	3		3			3	3	2	3						2
CO 2	3	3		3			3	3	2	3						2
CO 3	3				3			3	2	3						2

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Understanding the important aspects of fluid flow helps students to conduct the experiment
	PO2	3	Students can identify, formulate and analyse complex engineering problems related to basic flow metering devices and open channel flows.
	PO3	3	Students can design solutions for complex engineering problems considering health, safety and environment considerations.
	PO7	3	Will be able to assess the impact on society and environment.

	PO8	3	Conducting experiments and analysing provide professionalism, ethical attitude, communication skills.
	PO9	2	Conducting experiments helps students to understand the importance of individuals in team work.
	PO10	3	Experiments enable students to comprehend and prepare effective reports.
CO2	PO1	3	Understanding the important aspects of fluid flow helps students to conduct the experiment
	PO2	3	Students can identify, formulate and analyse complex engineering problems related to open channel flows.
	PO3	3	Students can design solutions for complex engineering problems considering health, safety and environment considerations.
	PO7	3	Will be able to assess the impact on society and environment.
	PO8	3	Conducting experiments and analysing provide professionalism, ethical attitude, communication skills.
	PO9	2	Conducting experiments helps students to understand the importance of individuals in team work.
	PO10	3	Experiments enable students to comprehend and prepare effective reports.
CO3	PO1	3	By understanding theories of buoyancy and stability students can perform the experiment.
	PO4	3	With the knowledge gained students can analyse and interpret data regarding the stability and arrive at valid conclusions.
	PO8	3	Conducting experiments and analysing provide professionalism, ethical attitude, communication skills.
	PO9	2	Conducting experiments helps students to understand the importance of individuals in team work.
	PO10	3	Experiments enable students to comprehend and prepare effective reports.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
C01	PSO3	2	Students will recognize the importance of working within multidisciplinary teams

C02	PSO3	2	Students will recognize the importance of working within multidisciplinary teams
C03	PSO3	2	Students will recognize the importance of working within multidisciplinary teams

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER 5

CE 301 DESIGN OF CONCRETE STRUCTURES I

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Design of concrete structures I**	Course code**: CE 301**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction- Plain and Reinforced concrete- Properties of concrete and reinforcing steel-Objectives of design-Different design philosophies- Working Stress and Limit State methods-Limit State method of design-Introduction to BIS code- Types of limit states characteristic and design values-partial safety factors-types of loads and their factors. Limit State of Collapse in Bending-assumptions-stress-strain relationship of steel and concrete- analysis of singly reinforced rectangular beams-balanced-under reinforced-over reinforced sections-moment of resistance codal provisions	9	15
II	Limit state of collapse in shear and bond- shear stresses in beamstypes of reinforcement-shear strength of RC beam-IS code recommendations for shear design-design of shear reinforcementexamples Bond and development length - anchorage for reinforcement bars - code recommendations regarding curtailment of reinforcement	9	15
III	Design of Singly Reinforced Beams- basic rules for design-design example of simply supported beam- design of cantilever beamdetailing Analysis and design of doubly reinforced beams – detailing, T-beams- terminology- analysis of T beams- examples - Design for torsion-IS code approach- examples.	9	15
IV	Design of slabs- introduction- one-way and two-way action of slabs - load distribution in a slab- IS recommendations for design of slabs- design of one-way slab- cantilever slab-numerical problems – concepts of detailing of continuous slab – code coefficients.	9	15
V	Two- way slabs- simply supported and restrained slabs – design using IS Code coefficients Reinforcement detailing Limit State of Serviceability- limit state of deflection- short term and long term deflection-IS code recommendations- limit state of cracking- estimation of crack width- simple numerical examples	10	20
VI	Stair cases- Types-proportioning-loads- distribution of loads – codal provisions - design and detailing of dog legged stair-Concepts of tread-riser type stairs (detailing only) Columns-introduction –classification- effective length- short column - long column - reinforcement-IS specifications regarding columns- limit state of collapse: compression -design of axially loaded short columns-design examples with rectangular ties and helical reinforcement	10	20

TEXT BOOKS/ REFERENCES:

1	Pillai S.U & Menon D – Reinforced Concrete Design, Tata McGraw Hill Publishing Co ., 2005
2	Punmia, B. C, Jain A.K and, Jain A.K ,RCC Designs, Laxmi Publications Ltd., 10e, 2015
3	Varghese P.C, Limit State Design of Reinforced Concrete, Prentice Hall of India Pvt Ltd,, 2008
4	Relevant IS codes (I.S 456, I.S 875, SP 34)

PREREQUISITE: CE202 Structural Analysis I

COURSE OBJECTIVES:

1	To provide the students with the knowledge of the behavior of reinforced concrete structural elements in flexure
2	To provide the students with the knowledge of the behavior of reinforced concrete structural elements in flexure

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Apply the fundamental basics, objectives and methods for the design of concrete structures.
2	Explain the bond, development length and design of RC beams with respect to shear.
3	Design and detailing of singly reinforced beam and comparison with doubly reinforced sections.
4	Design and detail one way slab using IS code recommendations.
5	Design and detail two way slab using IS code recommendations.
6	Apply the basics of stair proportioning with its design and design axially loaded short columns

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-		2	-	
CO2	3	3	-	-	-	-	-	-	-	-	-	-		3	2	
CO3	3	-	3	-	-	-	-	-	-	-	-	-		3	2	
CO4	3	-	3	-	-	-	-	-	-	-	-	-		3	2	
CO5	3	-	3	-	-	-	-	-	-	-	-	-		3	2	
CO6	3	2	3	-	-	-	-	-	-	-	-	-		3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Basic knowledge about the fundamental basics of design of concrete structures to solve Engineering problems in future.
CO2	PO1	3	Apply the basic knowledge on the behaviour of structural elements in bending, shear, compression, torsion etc.
	PO3	1	Study and Analyze the structural behaviour of concrete elements in bending, shear, compression, torsion etc.
CO3	PO1	3	Apply the basic general knowledge on design of beams.
	PO3	3	Design and detailing of beam.
CO4	PO1	3	Apply the basic general knowledge on design of one way slab.
	PO3	3	Design and detailing of one way slab.
CO5	PO1	3	Apply the basic general knowledge on design of two way slab.
	PO3	3	Design and detailing of two way slab.
CO6	PO1	3	Apply the basic general knowledge on proportioning a stair and design of short columns.
	PO2	2	Analyze the behavior of dog legged stair case.
	PO3	3	Design and detailing of short columns and dog legged stair.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	2	The graduates of the programme are able to understand fundamentals of limit state method of design.
CO2	PSO1	3	The graduates of the programme are able to design concrete members under shear and how to use IS codes for design purpose.
	PSO2	2	The graduates of the programme are able to understand how to design structures economically and safely for the infrastructural development.
CO3	PSO1	2	The graduates of the programme will acquire a basic knowledge on the behavior of singly reinforced concrete beams.
	PSO2	2	The graduates of the programme will have knowledge on that how to make singly reinforced beam elements safe in bending.
CO4	PSO1	3	The graduates of the programme are able to explain how a one way slab behaves under load distribution.
	PSO2	2	The graduates of the programme are able to design a one way slab for various structures safely to meet the IS specifications.
CO5	PSO1	3	The graduates of the programme are able to design a two way slab.

	PSO2	**2**	The graduates of the programme are able to explain how a two way slab behaves under load distribution.
CO6	**PSO1**	**3**	The graduates of the programme are able to analyze the behavior of compression members under axial loading
	PSO2	**2**	The graduates of the programme are able to design compression members for various structures safely to meet the IS specifications.

CE 303 STRUCTURAL ANALYSIS -11

COURSE INFORMATION SHEET:

Program: **Civil Engineering**	Degree :**B-Tech**
Course**:Structural Analysis**	Course code**: CE 303**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Clapeyrons Theorem (Three Moment Equation) :Derivation of threemoment equation - application of three moment equation for analysis of continuous beams under the effect of applied loads and uneven support settlement	7	15
II	Slope Deflection Method : Analysis of continuous beams- beams with overhang- analysis of rigid frames - frames without sway and with sway - different types of loads - settlement effects	7	15
III	Moment Distribution Method: Moment Distribution method – analysis of beams and frames – non sway and sway analysis	7	15
IV	Kani's Method: Kani's Method of analysis applied to continuous beams and single bay single storey rigid frames rigid frames – frames without sway and with sway	6	15
V	Beams curved in plan: Analysis of cantilever beam curved in plan, analysis of circular beams over simple supports.	7	20
VI	Plastic Theory: Introduction – plastic hinge concepts – plastic modulus – shape factor – redistribution of moments – collapse mechanisms – Plastic analysis of beams and portal frames by equilibrium and mechanism methods.(Single Storey and Single bay Frames only)	8	20

TEXT BOOKS:

1	Kenneth Leet, Chia M Uang & Anne M Gilbert., Fundamentals of Structural Analysis, McGraw Hill, 4e, 2010
2	R. Vaidyanathan and P. Perumal, Structural Analysis Volume I & II, Laxmi Publications (P) Ltd., 2017
3	Reddy . C.S., Basic Structural Analysis, Tata McGraw Hill, 3e, 2011

REFERENCES:

1	Daniel L Schodak, Structures, Pearson Education, 7e, 2014
2	Hibbeler, RC, Structural analysis, Pearson Education, 2012
3	Kinney J. S., Indeterminate Structural Analysis, Oxford & IBH, 1966
4	Negi L. S. and Jangid R. S, Structural Analysis, Tata McGraw Hill, 1997
5	Rajasekaran S. and Sankarasubramanian G., Computational Structural Mechanics, PHI, 2008

6	S.S. Bhavikatti, Structural Analysis II, Vikas Publication Houses (P) Ltd, 2016
7	SP:6 (6): Application of Plastic Theory in Design of Steel Structures, Bureau of Indian Standards, 1972
8	Timoshenko S. P. and Young D. H., Theory of Structures, McGraw Hill, 2e, 1965
9	Utku S, Norris C. H & Wilbur J. B, Elementary Structural Analysis, McGraw Hill, 1990
10	Wang C. K., Intermediate Structural Analysis, Tata McGraw Hill, 1989

PREREQUISITE: CE201 Mechanics of Solids

COURSE OBJECTIVES:

1	To equip the students with the force and displacement methods of structural analysis with emphasis on analysis of rigid frames and trusses

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Analyse beams using Three Moment Theorem
2	Analyse beams and rigid frames using Slope deflection method
3	Analyse beams and rigid frames using Moment Distribution method
4	Analyse beams and rigid frames using Kani's method
5	Analyse beams curved in plan
6	Analyse beams and rigid frames using plastic theory

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3												3		
CO2	3	3												3		
CO3	3	3												2		
CO4	3	3												3		
CO5	3	2												2		
CO	3	3												3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	The students will be able to apply the knowledge of mathematics, science and engineering fundamentals to solve and analyze continuous beams.
	PO2	2	The students will be able to identify and analyze complex continuous beams using first principles of mathematics, natural sciences and engineering sciences.
CO2	PO1	2	The students will be able to apply the knowledge of mathematics, science and engineering fundamentals to solve and analyse continuous beams and frames.
	PO2	2	The students will be able to identify and analyze complex continuous beams and frames using first principles of mathematics, natural sciences and engineering sciences

CO3	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science and engineering fundamentals to solve and analyze continuous beams and frames.
	PO2	**3**	The students will be able to identify and analyze complex continuous beams and frames using first principles of mathematics, natural sciences and engineering sciences
CO4	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science and engineering fundamentals to solve and analyze continuous beams and frames
	PO2	**2**	The students will be able to identify and analyze complex continuous beams and frames using first principles of mathematics, natural sciences and engineering sciences.
CO5	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science and engineering fundamentals to solve and analyze beams curved in plan
	PO2	**2**	The students will be able to identify and analyze curved using first principles of mathematics, natural sciences and engineering sciences
CO6	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science and engineering fundamentals to solve and analyze continuous beams and frames using plastic theory.
	PO2	**3**	The students will be able to identify and analyze complex continuous beams and frames using first principles of mathematics, natural sciences and engineering sciences

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	The graduates of the programme can analyze complex beams and frames using three moment theorem
CO2	**PSO1**	**3**	The graduates of the programme can analyze frames and beams using slope deflection method
CO3	**PSO1**	**2**	The graduates of the programme can analyse frames using moment distribution method
CO4	**PSO1**	**3**	The graduates of the programme can use Kanis method as a tool to solve complex structural frames
CO5	**PSO1**	**3**	The graduates of the programme can predict the behavior of beams curved in plan
CO6	**PSO1**	**2**	The graduates of the programme can use plastic theory of analysis

CE 305 GEOTECHNICAL ENGINEERING - II

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Geotechnical Engineering II**	Course code**: CE 305**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Stresses in soil due to loaded areas - Boussinesq's formula for point loads – assumptions [no derivation required] – Comments - numerical problems Vertical stress beneath loaded areas of strip, rectangular and circular shapes(no derivation required)- Newmark's chart[construction procedure not required] - Isobars- Pressure bulbsnumerical problems	6	15
II	Lateral earth pressure – At-rest, active and passive earth pressures – Practical examples Rankine's and Coulomb' theories[no derivation required]-Influence of surcharge, inclined backfill and water table on earth pressurenumerical problems Earth pressure on retaining walls with layered backfill- numerical problems	6	15
III	Bearing capacity of shallow foundations – Ultimate, safe and allowable bearing capacity. - Failure mechanism, assumptions and equation of Terzaghi's bearing capacity theory for strip footing[no derivation required] – Terzaghi's formulae for circular and square footings numerical problems Local and general shear failure - Factors affecting bearing capacity – Influence of water table - numerical problems Total and differential settlement- Causes - Methods of reducing differential settlement–Brief discussion on soil improvement through installation of drains and preloading	7	15
IV	Combined footings- Rectangular and Trapezoidal combined footings - numerical problems Raft foundations (Design Concepts only) - Allowable Bearing capacity of Rafts on sands and clays - Floating foundation. Deep foundations - Elements of a well foundation – Problems encountered in well sinking – Methods to rectify tilts and shifts	6	15
V	Pile foundations - Point bearing and friction piles - Bearing capacity of single pile in clay and sand[I.S. Static formulae] - numerical problems Dynamic formulae(Modified Hiley formulae only) - I.S. Pile load test [conventional]- Negative skin friction - numerical problems Group action - Group efficiency - Capacity of Pile groups- numerical problems	8	20
VI	Brief introduction to Machine foundation –Mass spring model	9	20

	for undamped free vibrations - Natural frequency – Coefficient of uniform elastic compression – Methods of vibration isolation Brief introduction to site investigation – Objectives - Guidelines for choosing spacing and depth of borings [I.S. guidelines only] - Auger boring and wash boring methods - Standard Penetration Test – procedure, corrections and correlations		

TEXT BOOKS:

1	Braja M. Das, "Principles of Foundation Engineering", Cengage Learning India Pvt. Ltd., Delhi, 2011.
2	K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers, 2011
3	Murthy V N S., "Advanced Foundation Engineering", CBS Publishers & Distributors Pvt. Ltd., New Delhi, 2007

REFERENCES

1	Alam Singh., "Soil Engineering in Theory and Practice", Vol.1, CBS Publishers & Distributors Pvt. Ltd., New Delhi. 2002
2	Gopal Ranjan and and Rao A.S.R., " Basic and Applied Soil Mechanics", New Age International (P) Limited, New Delhi, 2002.
3	Purushothamaraj P., Soil Mechanics and Foundation Engineering, Dorling Kindersley(India) Pvt. Ltd., 2013
4	TengW.E., "Foundation Design", Prentice Hall , New Jersey, 1962
5	.Venkataramiah, "Geotechnical Engineering", Universities Press (India) Limited, Hyderabad, 2000.

PREREQUISITE: CE208 Geotechnical Engineering - I

COURSE OBJECTIVES:

1	To impart to the students, in-depth knowledge about the basic concepts and theories of foundation engineering;
2	To enable the students to acquire proper knowledge about various methods of foundation analysis for different practical situations

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Calculate the stresses in soil due to loaded areas
2	Differentiate active and passive earth pressures and compute the earth pressure on retaining walls
3	Evaluate the bearing capacity of soil
4	Compare the rectangular and trapezoidal combined footings
5	Explain the concepts of pile foundations
6	Analyse various subsoil investigation procedures
7	Summarise fundamentals of dynamics and oscillations to understand the concept of machine foundations

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3													3		
CO2	3													3		
CO3	3	3												3		
CO4	3		3											3		
CO5	3													3		
CO6	3	3												3		
CO7	3													3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	The students should apply the fundamentals of soil mechanics to solve complex geotechnical problems involving stresses under loaded areas.
CO2	PO1	3	The students should apply the fundamentals of soil mechanics to solve complex geotechnical problems involving active and passive earth pressures.
CO3	PO1	3	The students should apply the fundamentals of soil mechanics and mathematics to compute the bearing capacity of soil and solve problems related to settlement.
	PO2	3	The students should analyse the bearing capacity of soil to arrive at a choice of foundation or to choose necessary ground improvement techniques.
CO4	PO1	3	The students should apply the theories of soil mechanics and solve practical problems regarding foundation selection
	PO3	3	The students should apply the fundamentals of foundation engineering to design combined footings.
CO5	PO1	3	The students should be able to apply the fundamental of foundation engineering to solve complex problems related to pile foundations.

CO6	**PO1**	**3**	The students should be able to apply the fundamentals of engineering geology, earth sciences and soil mechanics to conduct subsoil investigations.
	PO2	**3**	The students should refer relevant IS codes to determine the bore hall spacing and analyse the subsoil investigation data to choose appropriate foundations for the structure..
CO7	**PO1**	**3**	The students should apply the knowledge of engineering dynamics, physics and soil mechanics to solve complex problems related to ground vibrations.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will have knowledge to calculate the stresses in soil due to loaded areas
CO2	**PSO1**	**3**	Graduates will capable to differentiate active and passive earth pressures and compute the earth pressure on retaining walls
CO3	**PSO1**	**3**	Graduate will be able to determine the bearing capacity of soil
CO4	**PSO1**	**3**	Graduates will have a knowledge to design and compare rectangular and trapezoidal footings
CO5	**PSO1**	**3**	Graduates will be able to explain the concept of pile foundation
CO6	**PSO1**	**3**	Graduates will be able to analyse various subsoil investigations procedures
CO7	**PSO1**	**3**	Graduates will be able to make use of the fundamentals of dynamics and oscillations to understand the concept of machine foundations

CE 307 GEOMATICS

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Geomatics**	Course code**: CE 307**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Traverse Surveying - Methods of traversing, Checks in closed traverse, Traverse computations, Balancing the traverse-methods	6	15
II	Curve Surveying – Elements of simple and compound curves – Method of setting out– Elements of Reverse curve (Introduction only)– Transition curve – length of curve – Elements of transition curve - Vertical curve (introduction only)	8	15
III	Global Navigation Satellite System- Types, Global Positioning Systems-Components and Principles, Satellite ranging-calculating position, Satellite signal structure, code phase and carrier phase measurements, GPS errors and biases, Application of GPS	6	15
IV	GPS Surveying methods-Static, Rapid static , Kinematic methods – DGPS, Phases of GPS Survey -Planning and preparation, Field operation-horizontal and vertical control, data sheet, visibility diagram, Processing and report preparation,	6	15
V	Remote Sensing : Definition- Electromagnetic spectrum-Energy interactions with atmosphere and earth surface features-spectral reflectance of vegetation, soil and water-Classification of sensors Active and Passive, Resolution-spatial, spectral radiometric and Temporal resolution, Multi spectral scanning-Along track and across track scanning	8	20
VI	Geographical Information System-components of GIS, GIS operations, Map projections- methods, Coordinate systems Geographic and Projected coordinate systems, Data Types-Spatial and attribute data, Raster and vector data representation-Data Input methods-Geometric Transformation-RMS error, Vector data Analysis-buffering, overlay.	8	20

TEXT BOOKS:

1	Dr. B.C. Punmia , Ashok Kumar Jain & Arun Kumar Jain - Surveying , Laxmi publications (P) Ltd , 2005
2	Prof. T.P. Kenetkar and Prof. S.V. Kulkarni - Surveying and Levelling, Pune Vidyarthi Griha Prakashan,2004
3	R.Agor - A Text book of Surveying and Levelling, Khanna Publishers, 2005
4	S.K. Duggal - Surveying Vol. II, Tata McGraw Hill Ltd ,Reprint 2015

REFERENCES:

1	Burrough P , Principles of Geographical Information systems, Oxford University Press, 1998
2	Chang,K , "Introduction to Geographic Information Systems", Tata McGraw-Hill Publishing Co. Ltd, 2008
3	George Joseph, "Fundamentals of Remote Sensing", University Press, 2003
4	Iliffe, C.J., Datums and Map Projections for Remote Sensing, GIS and Surveying, Whittles Publishing, 2006
5	James M Andersen, Edward M Mikhail, Surveying Theory and Practice, McGraw Hill education, 7e, 1998
6	Kang-tsung Chang, „Introduction to GIS" , Tata McGraw-Hill Publishing Co. Ltd, 8e, 2016
7	Lillesand M and Kiefer W, "Remote Sensing and Image Interpretation". John Wiley and Sons,Inc., 2000

PREREQUISITE: CE207 Surveying

COURSE OBJECTIVES:

1	To impart awareness on the advanced surveying techniques
2	To understand the errors associated with survey measurements
3	To provide a basic understanding on geospatial data acquisition and its process

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Select proper method for balancing the error by understanding traversing, and its various methods.
2	Distinguish between different types of curves and choose the appropriate one by comprehending basics of curves.
3	Classify different types of available Global Navigation Satellite System (GNSSs) with special focus on Global Positioning System (GPS).

4	Identify the advanced methods like Differential GPS & prepare a schedule to carry out GPS surveying.
5	Apply the concept of Remote Sensing and GIS to analyze various Engineering Problems
6	Apply and arrive at solutions for various civil engineering aspects using Geographical Information System (GIS) tool

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1	1												3		
CO2	1	3	2												3	
CO3	3															1
CO4	3				2										2	
CO5	3				2									3		
CO6	3				3											

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	1	The students shall be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of open and closed traverses
	PO2	1	The students shall be able to identify and analyse the errors on traverses and balance the errors using first principles of mathematics and engineering sciences
CO2	PO1	1	The students shall be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to problems change in directions with considerations to traffic and transportation engineering
	PO2	3	The students shall be able to identify and analyse the different types of curves to be used and calculate the basic curve elements using first principles of mathematics and engineering sciences
	PO3	2	The students shall be able to bring out solutions to accommodation change in direction of travel ensuring public safety in road design
CO3	PO1	3	The students shall be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to understand the differential GPS (DGPS) and its concept as a enhancement to GPS and GNSS.
CO4	PO1	3	The students shall be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to understand the use of the remote sensing and GIS in identifying the real problems.
	PO5	2	The students shall be able to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for the analysis of various issues using GIS and remote sensing.
CO5	PO1	3	The students shall be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to understand the use of the remote sensing in identifying the real problems..

	PO5	**2**	The students shall be able to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for understanding the challenges caused using remote sensing
CO6	**PO1**	**3**	The students shall be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to understand the use of the GIS to depict the real time problems.
	PO5	**3**	The students shall be able to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools for the analysis of various issues using GIS

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates shall able to analysis the errors on traverses and balance the errors with the help of mathematics
CO2	**PSO2**	**3**	Graduates shall able to have a sound knowledge in the design of curve safely and economically
CO3	**PSO3**	**1**	Graduates will have the ability to function with modern techniques.
CO4	**PSO2**	**2**	Graduates will have a broad understanding of environment by implementing ideas of remote sensing and GIS.
CO5	**PSO1**	**3**	Graduates shall able to analysis various engineering problems by using remote sensing and GIS .

CE309 WATER RESOURCES ENGINEERING

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Water Resource Engineering**	Course code**: CE309**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Hydrologic cycle-precipitation-mechanism, types and forms. Measurement of rainfall using rain gauges-optimum number of rain gauges. Estimation of missing precipitation. Representation of rainfall data-mass curve and hyetograph. Computation of mean precipitation over a catchment. Design rainfall - probable maximum rainfall. Infiltration-measurement by double ring infiltrometer. Horton's model. Evaporation-measurement by IMD land pan, control of evaporation.	8	15
II	Runoff-components of runoff-methods of estimation of runoffinfiltration indices, Hydrograph analysis-Hydrograph from isolated storm-Base flow separation. Unit hydrograph – uses. Assumptions and limitations of unit hydrograph theory. Computation of storm/flood hydrograph of different duration by method of superposition and by development of S–Hydrograph	8	15
III	Irrigation– Necessity, Benefits and ill effects. Types: flow and lift irrigation - perennial and inundation irrigation. Methods: flooding, furrow, sprinkler and drip irrigation (concepts only, no design aspects/problems), Soil water plant relationships, soil moisture constants, Computation of crop water requirement: depth and frequency of Irrigation, Duty and delta, relationship, variation of duty, factors. Computation of design discharge of conveyance channels, Irrigation efficiencies. Consumptive use of water: concept of Evapotranspiration. (No detailed discussion on estimation procedures)	6	15
IV	Stream flow measurement: methods, Estimation of stream flow by area velocity method only, Stage discharge curve. Meandering of rivers, River training – objectives and classification, description of river training works.	6	15
V	Surface Water system: diversion and storage systems, necessity. River flow: Flow duration Curve, Firm yield. Reservoirs-types of reservoirs, zones of storage reservoir, reservoir planning-storage capacity and yield of reservoirs-analytical method and mass curve method. Reservoir sedimentation: trap efficiency, methods for control. Computation of useful life of reservoir.	7	20

VI	Ground water : vertical distribution of groundwater, classification of saturated formation, water table, Aquifer properties : Porosity, Specific yield, specific retention, Types of aquifers. Darcy's law, co-efficient of permeability, Transmissibility. Wells- Steady radial flow into a fully penetrating well in Confined and Unconfined aquifers. Estimation of yield of an open well, pumping and recuperation tests. Tube wells – types.	7	20

TEXT BOOKS:

1	Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, New Delhi, 2009.
2	Garg S.K, Irrigation Engineering and Hydraulic Structures Khanna Publishers New Delhi 2006.
3	Modi. P. N. Irrigation, Water Resources and Water Power Engineering, S.B.H Publishers and Distributors New Delhi 2009.
4	Punmia B.C. Ashok K Jain, Arun K Jain, B. B. L Pande, Irrigation and Water Power Engineering, Laxmi Publications (P) Ltd. 2010

REFERENCES:

1	Asawa. G.L. Irrigation and Water Resources Engineering, New Age International, 2000
2	Ojha.C.S.P., R.Berndtsson, P. Bhunya, Engineering Hydrology, Oxford university Press, 2015.
3	Patra. K.C., Hydrology and Water Resources Engineering, CRC Press, 2010.
4	Sahasrabudhe S.R., Irrigation Engineering & Hydraulic Structures, S.K. Kataria & Sons, 2013.
5	Subramanya. K., Engineering Hydrology, Tata Mc Graw Hill, 2011.
6	Todd D. K., Ground Water Hydrology, Wiley, 2005.
7	Ven Te Chow, David R Maidment, L.W Mays., Applied Hydrology, McGraw Hill, 1988
8	Warren Viessman, G.L. Lewis, Introduction to Hydrology, Pearson Education, 2003

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To impart knowledge regarding the availability of water on hydrosphere, its distribution and quantification
2	To convey the knowledge on the scientific methods for computing irrigation water requirements
3	To communicate fundamental knowledge on reservoir engineering and river engineering

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify the elements of hydrologic cycle and estimate different components
2	Estimate crop water requirements for design of irrigation systems
3	Identify the different stream flow measurement techniques and river training works
4	Estimate the storage capacity of reservoirs and their useful life.
5	Identify distribution and storage of groundwater and can compute the yield of aquifers and wells

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2													2		
CO2	3													3		
CO3	2													3		
CO4	3	3												3		
CO5	3													3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Able to understand the fundamentals of hydrologic cycle and its components
CO2	PO1	3	Engineering knowledge regarding the water requirement of crops is important in irrigation engineering
CO3	PO1	2	Knowledge on stream flow and river training works will help in controlling flooding in an area.
CO4	PO1	3	Reservoir planning knowledge is required for uniform distribution of water to all regions for different purposes.
	PO2	3	Can analyze drought/flood conditions to provide a solution
CO5	PO1	3	Knowledge in ground water distribution is required as it is a reliable source of water

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	The graduates of the programme are able to analyse various hydrological factors
CO2	**PSO1**	**3**	The graduates of the programme are able to design an irrigation system
CO3	**PSO1**	**3**	The graduates of the programme are able to identify the construction aspects of irrigation structure
CO4	**PSO1**	**3**	The graduates of the programme are able to identify useful life of an existing irrigation structure
CO5	**PSO1**	**3**	The graduates of the programme are able to compute yield of aquifers and wells

CE363 GEOTECHNICAL INVESTIGATION

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Geotechnical Investigation**	Course code**: CE363**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction and practical importance - Objectives of soil exploration – Planning of a sub-surface exploration programme – Collection of existing information, reconnaissance, preliminary and detailed investigation - I.S. and other guidelines for deciding the number, size, spacing and depth of boreholes	7	15
II	Methods of exploration - Open pits – Auger boring- -Wash boring, percussion drilling, rotary drilling – Comparison of the methods of exploration- Stabilization of bore holes Plate load test – Procedure, uses and limitations – modulus of subgrade reaction- Solution of numerical problems using plate load test data	6	15
III	Sounding methods Standard Penetration Test – Procedure – corrections to be applied to observed N values – Procedure for estimation of representative average N value – Numerical examples - Factors influencing the SPT results and precautions to obtain reliable results – Merits/drawbacks of the test – Correlations of N value with various engineering and index properties of soils Static Cone Penetration Test – Procedure – Merits/drawbacks – Correlation of static CPT results with soil properties -Dynamic Cone Penetration Test – Procedure – Merits/drawbacks – Critical comparison of SPT, static CPT and dynamic CPT	8	15
IV	Geophysical methods – Seismic refraction method – Procedure, uses, limitations – Solution of numerical problems to estimate the velocity of seismic waves and the thickness of upper layer of a two-layered soil system - Electrical resistivity method – Electrical profiling and electrical sounding – Procedure, uses, limitations Pressure meter test - Procedure –Uses - limitations	6	15
V	Soil sampling – Undisturbed, disturbed, and representative samples – Chunk and tube samples – Factors affecting sample disturbance and methods to minimise them –Area ratio - Inside clearance - Outside clearance - Recovery ratio –Ball check valve – Handling and transportation of samples – Extrusion of samples Types of samplers – Thin walled sampler – Piston sampler – Split spoon sampler – Methods for collection of sand samples from beneath the water table - Core retainers	8	20
VI	Rock Quality Designation –Bore log – Soil profile – Sub-soil		20

	investigation report Static pile load test – procedure for estimation of safe load - Cyclic pile load test –Procedure for separation of end bearing and skin friction resistance- solution of numerical problems using static and cyclic pile load test data	7	

TEXT BOOKS:

1	Gopal Ranjan and Rao A.S.R., " Basic and Applied Soil Mechanics", New Age International (P) Limited, New Delhi, 2002.
2	Venkataramaiah, "Geotechnical Engineering", Universities Press (India) Limited, Hyderabad, 2000

REFERENCES:

1	Arora K.R., " Geotechnical Engineering", Standard Publishers Distributors, New Delhi, 2006.
2	Joseph E. Bowles, „Foundation Analysis and Design", Mc. Graw Hill Inc., New York, 1988.
3	Purushothamaraj P., Soil Mechanics and Foundation Engineering, Dorling Kindersley(India) Pvt. Ltd., 2013
4	Terzaghi K. and R. B. Peck, Soil Mechanics in Engineering Practice, John Wiley, 1967

PREREQUISITE: CE208 Geotechnical Engineering - I

COURSE OBJECTIVES:

1	To impart to the students, a clear idea about how a geotechnical investigation programme is to be planned and executed;
2	To impart in-depth knowledge about the various methods of geotechnical investigation and the field tests to be conducted in different situations

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Understand the requirement and importance of soil exploration programme.
2	Identify the different methods of exploration and examine the bearing capacity of soil using plate load test.
3	Examines the bearing capacity of soil using sounding methods such as penetration tests.
4	Analyze the properties of soil in different strata using geophysical methods.
5	Prepare Geotechnical Investigation report to suit the requirements of a project including necessary recommendations.
6	Prepare a report of soil profile and bore log will and examine the bearing capacity of soil using different types of pile load test

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2												3		
CO2		2			3									3		
CO3		3			3									3		
CO4	1				3									3		
CO5	2				3									3		
CO6						2	1	1						3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of fundamental engineering in identifying the type and properties of soil.
	PO2	2	Able to identify the number, size and spacing and depth of bore hole.
CO2	PO2	3	Able to analyse the soil for its strength from the obtained field test by using engineering mathematics
	PO5	3	Able to select and apply appropriate technique for determining the bearing capacity of soil using laboratory test.
CO3	PO2	3	Able analyze soil for determining the bearing capacity of soil using principles of mathematics and engineering science
	PO5	3	Able to select and apply appropriate technique for determining the bearing capacity of soil using field test.
CO4	PO1	1	Apply the knowledge of fundamental engineering to study the properties of different soil strata
	PO5	3	Able to select and apply appropriate technique for determining the bearing capacity of soil using field test.
CO5	PO1	2	Apply the knowledge of fundamental engineering to study the factors affecting sample disturbance
	PO5	3	Able to select and apply appropriate tools for collection of soil samples for laboratory test
CO6	PO6	2	Able to prepare a detailed report based on the subsoil investigation results which meets the societal, health, safety, legal and cultural issues
	PO7	1	Able to incorporate the need for sustainability in preparing the reports
	PO8	1	Able to incorporate ethical principles in preparing the reports

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to understand the importance of subsoil exploration, steps involved in the process and IS guide lines for fixing number size and spacing of bore holes
CO2	**PSO1**	**3**	Graduates will have a thorough knowledge in different methods of exploration and different types of instruments used for soil exploration. They are also capable of solving problems to find the strength of soil using laboratory test.
CO3	**PSO1**	**3**	Graduates will have a thorough knowledge in different sounding methods and are capable of solving problems to find the strength of soil.
CO4	**PSO1**	**3**	Graduates will have a thorough knowledge in different geophysical methods and are capable of understanding the properties of soil in different strata.
CO5	**PSO1**	**3**	Graduates will have a thorough knowledge in different types of samples collected from site and they will have a thorough knowledge in different types of instruments used for sample collection.
CO6	**PSO1**	**3**	Graduates will able to prepare a detailed investigation report for further development of the project
	PSO2	**2**	Graduates will able to corporate the economical, environmental, societal and safety factors involved in infrastructural development.

CE371 ENVIRONMENT AND POLLUTION

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Environment and pollution**	Course code**: CE371**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Environment-Introduction-Multidisciplinary Nature Components of Environment, Ecology, Ecosystem- Material CyclingCarbon and Nitrogen cycles Introduction: Classification of Pollution and Pollutants of environment, Pollution related Diseases, Basic requirements for healthy environment	6	15
II	Air Pollution: Primary and Secondary Pollutants, Industrial Pollution, Ambient Air Quality Standards, Types of air pollutants-sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter. Effects of air pollutants on human, vegetation and environment	6	15
III	Water Pollution: Point and Non-point Source of Pollution, Major Pollutants of Water, Physical, chemical and biological characteristics of water , Water borne diseases, Water Quality standards	7	15
IV	Solid Waste: Classification of Solid Waste, Composition and Characteristics of Solid Waste, Plastic wastes; Segregation of Solid waste, recycling and reuse of solid wastes, E-waste: Sources of generation,.	7	15
V	Land/Soil Pollution: Effects of urbanization on land degradation, Impact of Modern Agriculture on Soil, pesticide pollution, Effect on Environment and Life sustenance, Abatement measures	8	20
VI	Noise pollution: Sources of Noise, Effects of Noise, measurement of noise, Equivalent sound pressure level, Control measures	8	20

TEXT BOOKS /REFERENCES:

1	B.C.Bhartia, Environmental Pollution and Control in Chemical Process Industries, Khanna Publishers, Delhi, 2001.
2	Danny D Reible, Fundamentals of Environmental Engineering, CRC Press, 1998
3	Gilbert M Masters, Wendell P Ela, Introduction to Environmental Engineering and Science, Pearson Education, 2007
4	Howard S Peavy, Donald R Rowe, George Tchobanoglous, Environmental Engineering, McGrawHill Education , 1984
5	Kurian Joseph & R.Nagendran, Essentials of Environmental Studies, Pearson Education (Singapore) Pvt.Ltd, New Delhi, 2004.

6	N.N Basak, Environmental Engineering, McGrawHill Education, Reprint 2015
7	P.AarneVesiland, Introduction to Environmental Engineering, PWS publishing company Boston, 1997.
8	Suresh K Dhameja, Environmental Engineering and Management, S.K.Kataria& Sons, Delhi, 2010

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To understand the various types of environmental and industrial pollution,pollutants, related diseases and their causes
2	To impart the various management techniques available for pollution abatement

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain the fundamentals of environment and related processes
2	Recognize important aspects of air pollution and effects of air pollutants
3	Describe about water quality and water pollution and its effects
4	Recognize various aspects of solid waste management and its importance
5	Identify various impacts of land pollution on environment
6	Quote various properties of noise and to describe its measurement and control

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**1**						**2**							**2**		
CO2	**1**					**1**	**2**								**2**	
CO3	**1**					**1**	**2**								**2**	
CO4	**1**					**1**	**2**								**2**	
CO5	**1**					**1**	**2**								**2**	
CO6	**1**	**1**				**1**	**2**								**2**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Will apply knowledge of science in understanding environment and related processes.
	PO7	2	Will understand basic elements of sustainability
CO2	PO1	1	apply the knowledge of science in air pollution studies
	PO6	1	Will apply information with regard to air pollution helpful to the society.
	PO7	2	Discuss the need of knowledge of air pollution in sustainable development of the society.
CO3	PO1	2	able to apply the knowledge of mathematics, science fundamentals to know the different pollution abatement measures
	PO6	1	Will apply information with regard to water pollution helpful to the society.
	PO7	1	Importance of water quality and sustainability
CO4	PO1	1	able to apply the knowledge of mathematics, science fundamentals to analyze the aspects of solid waste management processes.
	PO6	1	Will apply information with regard to solid waste helpful to an hygienic society.
	PO7	2	Importance of solid waste management for access to safe water and air.
CO5	PO1	1	apply the knowledge of science in soil pollution studies
	PO6	1	Will apply information with regard to soil pollution helpful to the society.
	PO7	2	Discuss and explain the need of knowledge of land pollution in sustainable development of the society.
CO6	PO1	1	apply the knowledge of science in noise pollution studies
	PO2	1	Will identify and research literature about noise pollution control devices
	PO6	1	Will apply information with regard to noise pollution helpful to the society.
	PO7	2	Importance and uniqueness of noise pollution and control measures needed for the good environment for all living creatures

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	2	The graduates of the programme will have knowledge of the environment and environmental processes.
CO2	PSO2	2	The graduates of the programme will have a broad knowledge of different types of environmental pollution and their impact
CO3	PSO2	2	The graduates of the programme will have knowledge of environmental pollution control methods and techniques associated with infrastructure development.
CO4	PSO2	2	The graduates of the programme will have knowledge of environmental pollution control methods and techniques associated with infrastructure development.
CO5	PSO2	2	The graduates of the programme will have knowledge of environmental pollution control methods and techniques associated with infrastructure development.
CO6	PSO2	2	The graduates of the programme will have knowledge of environmental pollution control methods and techniques associated with infrastructure development.

CE341 DESIGN PROJECT

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Design Project**	Course code**: CE341**
L-T-P**:0-1-2**	Credit**:2**

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To understand the engineering aspects of design with reference to simple products
2	To foster innovation in design of products, processes or systems
3	To develop design that add value to products and solve technical problems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Contrast innovations on the development of components, products, processes or technologies in the engineering field.
2	Analyse the problem requirements and arrive workable design solutions

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	-	-	3	3	3	-	1	-	2	-	-	-		3	1	3
CO2	-	3	3	1	2	-	-	-	1	-	-	-		3	1	3

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO3	3	Design solutions for different engineering problems and design system components to meet the specifications with consideration.
	PO4	3	Research-based knowledge including design, analysis and interpretation of data to provide valid conclusions.
	PO5	3	Apply appropriate techniques, resources, and modern engineering softwares and IT tools for analyzing, modeling and designing to complex engineering activities with an understanding of the limitations.
	PO7	1	Analyse the impact of the professional engineering solutions in societal and

			environmental contexts.
	PO9	**2**	Perform effectively as an individual, and as a team member.
CO2	**PO2**	**3**	Analyze engineering problems and arrive at substantiated conclusions using mathematical, natural, and engineering sciences and through experiments.
	PO3	**3**	Design solutions for engineering problems by analyzing it through different methods.
	PO4	**1**	Research-based knowledge including analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**2**	Apply modern engineering IT tools to complex engineering activities with an understanding of the limitations.
	PO9	**1**	Perform effectively as an individual, and as a team member.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates shall demonstrate knowledge in modelling, analysis, design, laboratory investigations of civil engineering infrastructures.
	PSO2	**3**	Graduates will have a broad knowledge to evaluate economical and safety factors involved in infrastructural development.
	PSO3	**3**	Graduates can perform effectively as a team member and leader and using modern tools and techniques.
CO2	**PSO1**	**3**	Graduates acquire knowledge in analysis, design, laboratory investigations on civil engineering infrastructure.
	PSO2	**3**	Graduates will have a broad knowledge to evaluate economical and safety factors involved in infrastructural development.
	PSO3	**3**	Graduates can perform effectively as a team member and leader and using modern tools and techniques.

CE331 MATERIAL TESTING LAB -II

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Material Testing lab II**	Course code**: CE331**
L-T-P**:0-0-3**	Credit**:1**

List of Experiments:

1. Determination of the Specific Gravity and Soundness of cement
2. Determination of the Standard Consistency, Initial and Final Setting Times of Cement and the compressive strength of Cement.
3. Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modules, moisture content , bulk density
4. Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
5. Tests on Fresh Concrete: Workability : Slump, Vee-Bee, Compaction factor tests ,flow test
6. Determination of the Compressive Strength of Concrete by Cube and Cylinder.
7. Carrying out the Split Tensile and Flexural strength of Concrete.
8. Compressive strength of Brick as per IS
9. Transverse strength of tiles
10. Demonstration of Mix Design of Concrete by IS methods
11. Non destructive tests (rebound hammer & ultrasonic pulse velocity)

BOOKS/MANUALS /REFERENCES

1	Concrete Lab Manual, TTTI Chandigarh
2	M.L. Gambhir, Concrete Manual, Dhanpat Rai & Sons, Delhi.
3	M.S.Shetty , Concrete Technology, Theory and Practice , S.Chand& Company, 2014
4	Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009), SP23]

PRE-REQUISITE: CE204 Construction Technology

COURSE OBJECTIVES:

1	This course provides students opportunities to become familiar with standard mechanical testing methods and fundamental properties of engineering materials

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Measure tensile and compressive strength of a specimen for applying in a practical design based project work
2	Determine hardness, impact strength, fatigue strength to analyze the application of a specific material for a given design requirements for different loading conditions of structures
3	Judge the capacity of a material to withstand torsional stresses for a safe and sustainable design of machine elements

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3			3										3		
CO2	3			3										3		
CO3	3			3										3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of engineering fundamentals to find the desired material property
	PO4	**3**	Conduct investigation on engineering materials
CO2	**PO1**	**3**	Apply the knowledge of engineering fundamentals to find the desired material property
	PO4	**3**	Conduct investigation on engineering materials
CO3	**PO1**	**3**	Apply the knowledge of engineering fundamentals to find the desired material property
	PO4	**3**	Conduct investigation on engineering materials

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	The graduates of the programme will sound knowledge in laboratory investigations
CO2	**PSO1**	**3**	The graduates of the programme will sound knowledge in laboratory investigations
CO3	**PSO1**	**3**	The graduates of the programme will sound knowledge in laboratory investigations

CE333 GEOTECHNICAL ENGINEERING LAB

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**:Geotechnical Engineering Lab**	Course code**: CE333**
L-T-P**:0-0-3**	Credit**:1**

List of Experiments:

1 Determination of Water Content, Specific Gravity and Shrinkage Limit

2. Field Density determination and Sieve Analysis

3. Atterberg Limits (Liquid Limit and Plastic Limit)

4. Hydrometer Analysis

5. Direct Shear test

6. Standard Proctor Compaction Test

7. Permeability Test and Unconfined Compression Test

8. Consolidation Test

9. Swelling Test

10. Heavy compaction

11. California Bearing Ratio Test

BOOKS/MANUALS /REFERENCES

1	IS codes relevant to each test
2	C. Venkatramaiah, Geotechnical Engineering, New Age International publishers, 2012
3	Gopal Ranjan and A. S. R. Rao, Basic and Applied Soil Mechanics, New Age International Publishers, 2012
4	K. R. Arora, Soil Mechanics and Foundation Engineering, Standard Publishers, 2011

PRE-REQUISITE: CE208 Geotechnical Engineering – I

COURSE OBJECTIVES:

1	To understand the laboratory tests used for determination of physical, index and Engineering properties of soil.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Demonstrate the procedures of laboratory tests used for determination of physical, index and engineering properties of soils
2	Classify soils based on test results and interpret engineering behavior based on test results
3	Interpret the permeability characteristics of soils
4	Assess the shear strength of soils
5	Evaluate compaction characteristics required for field application

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2	1				1		1	1			1		3		
CO2	2	1						1	1			1		3		
CO3	2	1						1	1			1		3		
CO4	2	1					1	1	1			1		3		
CO5	2	1					1	1	1			1		3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**2**	Knowledge of fundamentals of soil mechanics is essential for conducting experiments
	PO2	**1**	Analyse the behaviour of soils to reach conclusions about the behaviour and classification of soil groups
	PO6	**1**	Application of reasoning to the information obtained from tests and use the conclusions for engineering practices in society
	PO8	**1**	Has to follow professional ethics laboratory sessions
	PO9	**1**	Conduct of laboratory section as teams
	PO12	**1**	Students should be able to refer IS codes and modifications.
CO2	**PO1**	**2**	Knowledge of fundamentals of soil mechanics is essential for conducting experiments
	PO2	**1**	Analyse the behaviour of soils to reach conclusions about the behaviour and classification of soil groups

	PO8	**1**	Has to follow professional ethics laboratory sessions
	PO9	**1**	Conduct of laboratory section as teams
	PO12	**1**	Students should be able to refer IS codes and modifications.
CO3	**PO1**	**2**	Knowledge of fundamentals of soil mechanics is essential for conducting experiments
	PO2	**1**	Analyse the behaviour of soils to reach conclusions about the behaviour and classification of soil groups using permeability data
	PO8	**1**	Has to follow professional ethics laboratory sessions
	PO9	**1**	Conduct of laboratory section as teams
	PO12	**1**	Students should be able to refer IS codes and modifications.
CO4	**PO1**	**2**	Knowledge of fundamentals of soil mechanics is essential for conducting experiments
	PO2	**1**	Analyse the behaviour of soils to reach conclusions about the behaviour and classification of soil groups using shear strength data
	PO7	**1**	Settlement determination is unavoidable for application of soil mechanics for safety purpose
	PO8	**1**	Has to follow professional ethics laboratory sessions
	PO9	**1**	Conduct of laboratory section as teams
	PO12	**1**	Students should be able to refer IS codes and modifications.
CO5	**PO1**	**2**	Knowledge of fundamentals of soil mechanics is essential for conducting experiments
	PO2	**1**	Analyse the behaviour of soils to reach conclusions about the behaviour and classification of soil groups using compaction details
	PO7	**1**	Identification of compaction characteristics is essential for construction and development in areas with problematic soil conditions
	PO8	**1**	Has to follow professional ethics laboratory sessions
	PO9	**1**	Conduct of laboratory section as teams
	PO12	**1**	Students should be able to refer IS codes and modifications.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will have knowledge about basic soil properties of soil and its determination
CO2	**PSO1**	**3**	Graduates will capable to classify the soil into different groups
CO3	**PSO1**	**3**	Graduate will be able to analyse the soil using permeability characteristics
CO4	**PSO1**	**3**	Graduates will have a knowledge to analyse the soil using shear parameters
CO5	**PSO1**	**3**	Graduates will have a knowledge about compaction methods

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER VI

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

VISION

"Strive for excellence in generation and dissemination of knowledge."

MISSION

- To mould engineers of tomorrow, who are capable of addressing the problems of the nation and the world, by imparting technical education at par with international standards
- To instil a desire in students for research, innovation, invention and entrepreneurship
- To strive for creative partnership between the industry and the Institute
- To impart the values of environment awareness, professional ethics, societal commitment, life skills and a desire for lifelong learning

DEPARTMENT OF CIVIL ENGINEERING

VISION

To emerge as a department producing graduate professionals in Civil Engineering having quality, leadership and commitment to the profession by keeping stride with new changes and challenges

MISSION

- To create quality civil engineers with clear understanding of fundamentals of civil engineering subjects.
- To transform the students into highly competent and technologically efficient and creative professionals
- To inculcate among the students a feeling of societal commitment, ownership of profession and ethical values

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

The graduates from Civil Engineering program are expected to achieve the following Program Educational Objective within a few years of graduation

PEO1: Utilize the solid foundation in science and engineering basics to handle any civil engineering problems.

PEO2: Conversant in planning, designing, construction and maintenance of civil engineering structures for the wellbeing of society.

PEO3: Capable of developing the culture of lifelong learning through interaction during conferences, workshops and field visits.

PEO4: Prepared to face challenges in profession and attain positions of leadership in an organization and/or on teams.

PROGRAM OUTCOMES (PO):

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OBJECTIVES (PSO)

The **Civil Engineering** program graduates will be able to

PSO1: Demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.

PSO2: Have a broad understanding of economical, environmental, societal and safety factors involved in infrastructural development.

PSO3: Demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.

CE302 DESIGN OF HYDRAULIC STRUCTURES

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Design of Hydraulic structures**	Course code**: CE302**
L-T-P**: 4-0-0**	Credit**: 4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Diversion head works- layout and functions of components, Weir and barrage- Causes of failure of weirs on permeable soils - Bligh's theory. Design of vertical drop weir. Khosla's theory of independent variables- Khosla's corrections-Use of Khosla's charts.	6	15 %
II	Irrigation canals, canal alignment- cross section of unlined canals- Design of canals through alluvial soils-Kennedy's theory and Lacey's theory. Cross drainage works-Types, selection of suitable type, Type of aqueducts. Regulation Works - Canal falls-necessity, classification. Canal regulators- Regulator cum road bridge- Head regulators and cross regulators.	8	15 %
III	Design and Drawing of the following hydraulic structures: 1. Aqueduct (Type III) 2. Syphon Aqueduct (Type III) 3. Canal Fall (Trapezoidal Notch type) 4. Siphon Well Drop 5. Sarda Type Fall (High Discharge only) 6. Cross Regulator (Using Khoslas Theory)	30	50 %
IV	Dams-Types, Gravity dam – selection of site- forces acting - stability analysis and modes of failure – Principal and shear stresses- Problems - Elementary profile –limiting height of gravity dams- high and low dams- Practical profiles, Functions of various components shafts, keys,	6	10 %

	water stops, and different 6types of gallery, Grouting. Instrumentation in dams (Concept only).		
V	Arch dams-types, methods for design (list only)-Thin cylinder theory. Earth dams-types, causes for failure and design criteria. Spillways-Types. Effective length of spillway- Ogee type spillway- profile. Energy dissipation below spillways - Stilling basins- Indian standard Type I and Type II (design not necessary).	6	10 %

TEXT BOOKS:

1	Garg S.K, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2006.
2	Modi. P. N., Irrigation Water Resources and Water Power Engineering, Standard Book House, 2009.
3	Punmia B.C. Ashok K Jain, Arun K Jain, B. B. L Pande, Irrigation and Water Power Engineering, Laxmi Publications (P) Ltd. 2010.

REFERENCES:

1	Arora, K.R., "Irrigation, Water Power and Water Resources Engineering", Standard Publishers Distributors, 2010.
2	Asawa. G.L. Irrigation and Water Resources Engineering, New Age International, 2000
3	Sahasrabudhe S.R., Irrigation Engineering & Hydraulic Structures, S.K. Kataria & Sons, 2013
4	Sathyanarayana M. C. Water Resources Engineering-Principles and Practice, New Age International Publishers. 2009
5	Varshney, R.S. Theory & Design of Irrigation Structures - Vol III, Nem Chand & Bros., Roorkee.

PREREQUISITE: CE309 Water Resources Engineering

COURSE OBJECTIVES

1	To understand the structural and hydraulic behavior of minor irrigation structures
2	To design minor irrigation structures
3	To get the fundamental concepts related to dams
4	To understand the failure modes and reasons for those of gravity dams.
5	To perform stability analysis of dams.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Analyze diversion head work and its important design aspects
2	Discuss analysis and design of irrigation canals and its elements
3	Analyze and design minor irrigation structures with their all important components
4	Analyze dams and thus to check whether it is safe or not
5	Identify various types of spillways and their suitability

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2	1											3	1	
CO2	2	2	3			1								3		
CO3	3	3	3			1	1							2	2	
CO4	3	2	2											3		
CO5	3	2	2											2		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Applying the basic knowledge of engineering mechanics and mathematics to do the analysis of diversion structures.
	PO2	2	Analyzing the structure to find stress at critical sections
	PO3	1	Getting best solution for engineering problems.
CO2	PO1	2	Applying the basics of material science to find the behaviour of canals.
	PO2	2	Analysing the structure with the help of basics of science and

			mathematics
	PO3	1	Finding a most suitable measures to avoid the failure
	PO6	1	These are one of the most important structures for the well functioning of society
CO3	PO1	3	Analyzing the structure using basic knowledge of physics and mathematics.
	PO2	3	Use of knowledge of material science and mathematics to understand the behavior of structure
	PO3	3	Finding out the most viable solution considering all the technical and nontechnical aspects.
	PO6	1	These structures and one of the most important elements in social and economical growth of nation.
	PO7	1	Will get idea about the concept of sustainable development.
CO4	PO1	3	Applying the basics of material science to find the failure patterns.
	PO2	2	Analyzing the structure to find stress at critical sections
	PO3	2	Finding the most suitable sections.
CO5	PO1	3	Applying the basics knowledge of material science to predict behavior of spill ways.
	PO2	2	Analyzing complex flow patterns using mathematical tools
	PO3	2	Identifying most suitable solution

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	After this course students get idea about diversion head work and its design aspects
	PSO2	3	Students will get an idea about the important aspects of infrastructure development
CO2	PSO1	3	Ability of understand analyze complex engineering problems will be enhanced by this.
	PSO2		
CO3	PSO1	2	This includes both analysis and design. Thus it will definitely improve the ability to understand and solve complex engineering problems

	PSO2	**2**	These structures are one the most important pillars of infrastructure development
CO4	**PSO1**	**3**	Completion of this course will make students able to analyze dams and related elements.
CO5	**PSO1**	**2**	This objective includes solution of complex problems, flow over spill ways, using basics of mathematics and engineering.

CE304 DESIGN OF CONCRETE STRUCTURES II

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Design of concrete structures II**	Course code**: CE304**
L-T-P**:** **3-0-0**	Credit**:** **3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Analysis and design of short columns under eccentric loading- Columns subjected to compression and uniaxial bending- design using SP16 charts for limit state Columns subjected to combined axial load and biaxial bending moments-code procedure for design- design using SP16 charts for limit state Slender columns- behavior of slender columns-braced and unbraced columns-design procedure- design using SP16 charts for limit state	8	15 %
II	Foundations- classification-IS code provisions for design of isolated footings- design principles of rectangular footings- Design of rectangular footings-uniform thickness and sloped- eccentrically loaded rectangular footing of uniform thickness-detailing. Combined footings (design principles only)- analysis of combined footings-rectangular and trapezoidal.	8	15 %
III	Retaining walls-Types- Cantilever retaining wall- earth pressure and forces acting-stability-proportioning-structural behavior of components -design example of cantilever retaining wall without surcharge-detailing Counterfort retaining wall-design principles of components and detailing (design not required)	6	15 %

IV	Circular slabs- stresses- reinforcements- simply supported, fixed and partially fixed subjected to uniformly distributed loads Design and detailing of spherical and conical domes	6	15 %
V	Introduction to design of water tanks-design philosophy and requirements-joints- IS code recommendations Design of rectangular water tanks using IS code coefficients (IS 3370). Design of circular water tanks using- IS code coefficients (IS 3370)	7	20 %
VI	Introduction to Pre-stressed concrete: Concept of pre-stressing- Materials-High strength concrete and high tensile steel. Analysis of pre-stressed beams (Rectangular and I-sections) at stages of transfer and service. Losses in Prestress	7	20 %

TEXT BOOKS/ REFERENCES:

1	N. Krishnaraju, Prestressed Concrete , Tata McGraw- Hill, 5e, 2012
2	Pillai S.U & Menon D – Reinforced Concrete Design, Tata McGraw Hill Book Co., 2009
3	Punmia, B. C, Jain A.K and, Jain A.K , R C C Designs, Laxmi Publications Ltd., 10e, 2015
4	Relevant IS codes (IS 456, IS 875IS 1343, IS 3370, SP 16, SP 34)

PREREQUISITE: CE301 Design of Concrete Structures – I

COURSE OBJECTIVES

1	To provide knowledge in the structural design of selected advanced structures of concrete and enable them to design reinforced concrete structures for real-world applications

COURSE OUTCOMES:

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

CO's	DESCRIPTION

1	Design eccentrically loaded and slender columns using SP 16 design charts.
2	Design different types of foundations.
3	Design and detail cantilever retaining wall and understand the design principles of Counter fort retaining wall
4	Design and detail circular slabs and domes.
5	Design rectangular and circular water tanks using IS code coefficients (IS 3370).
6	Gain knowledge of prestressed concrete fundamentals and analyse pre and post tensioned beams.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-		3	2	1
CO2	3	2	3	-	-	-	-	-	-	-	-	-		3	2	1
CO3	3	2	3	-	-	-	-	-	-	-	-	-		3	2	1
CO4	2	2	3	-	-	-	-	-	-	-	-	-		3	2	1
CO5	2	-	3	-	-	-	-	-	-	-	-	-		3	2	1
CO6	3	3	-	-	-	-	-	-	-	-	-	-		-	3	-

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge on types and fundamentals of compression members.
	PO2	**3**	Analyze the behavior of compression members under different loading conditions.
	PO3	**3**	Design and detail compression members as structural component to meet the specifications.
CO2	**PO1**	**3**	Apply the basic knowledge on types and fundamentals of foundation.
	PO2	**2**	Study and Analyze the behavior of combined footings with design principles.
	PO3	**3**	Design and detail isolated footings with IS code provisions.
CO3	**PO1**	**3**	Apply the basic knowledge on types, proportioning and fundamentals of retaining walls.
	PO2	**2**	Study and Analyze the structural behavior of counterfort retaining wall components with design principles.

	PO3	3	Design and detail cantilever retaining wall with IS code provisions.
CO4	PO1	2	Apply the basic general knowledge on circular slabs and domes.
	PO2	2	Analyze the behavior of circular slabs under stresses.
	PO3	3	Design and detailing of spherical and conical domes.
CO5	PO1	2	Apply the basic knowledge on requirements and design philosophy of water tanks.
	PO3	3	Design and detailing of rectangular and circular water tanks.
CO6	PO1	3	Apply the basic knowledge on concept, materials and losses of prestressed concrete.
	PO2	3	Analysis the pre-stressed beams (Rectangular and I-sections) at stages of transfer and service.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	The graduates of the programme are able to design and detail compression members for different loading conditions.
	PSO2	2	The graduates of the programme are able to understand how to design the structures safely to meet all the IS specifications.
	PSO3	1	Graduates will develop robust application of drafting oriented software with ease.
CO2	PSO1	3	The graduates of the programme are able to design and detail isolated foundation.
	PSO2	2	The graduates of the programme are able to understand how to design foundation safely to meet the IS specifications.
	PSO3	1	Graduates will develop robust application of drafting oriented software with ease.
CO3	PSO1	3	The graduates of the programme are able to design and detail cantilever type retaining wall.
	PSO2	2	The graduates of the programme are able to understand how to design retaining wall to satisfy the IS specifications.
	PSO3	1	Graduates will develop robust application of drafting oriented software with ease.
CO4	PSO1	3	The graduates of the programme are able to design and detail circular slabs and domes.

	PSO2	**2**	The graduates of the programme are able to understand how to design domes for various structures safely to meet the IS specifications.
	PSO3	**1**	Graduates will develop robust application of drafting oriented software with ease.
	PSO1	**3**	The graduates of the programme are able to design and detail rectangular and circular water tanks.
CO5	**PSO2**	**2**	The graduates of the programme are able to understand how to design water tank with the IS specifications to meet various societal purposes.
	PSO3	**1**	Graduates will develop robust application of drafting oriented software with ease.
CO6	**PSO2**	**3**	The graduates of the programme are able to understand the concept of prestressing and also about the materials and analysis (rectangular & I section) of prestressed concrete structures.

CE306 COMPUTER PROGRAMMING AND COMPUTATIONAL TECHNOQUES

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Computer Programming and Computational Techniques**	Course code**: CE306**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction to C++: Structure of C++ program; Character set; Keywords; Identifiers; Data types – integer, real, character, string, Boolean, Enumerated data types, Constants and Variables; Operators – assignment, arithmetic, relational, logical, increment, decrement and conditional operators; Statements – simple & compound, declaration statements. Input and output streams. Selection statements: if, if-else, switch statements	7	15 %
II	Looping statements - for, while, do-while statements, Jump statements – break, continue, goto, exit (). Arrays – single and multi-dimensional arrays, initializing array elements, pointers & arrays, Character arrays, string functions, Unformatted console I/O functions, Unformatted Stream I/O functions. Preparation of programs for evaluation of factorial of a number, Infinite series, Sorting, Searching and Matrix manipulations.	6	15 %
III	User defined functions – Arguments, return values, call by value, call by reference, functions calling functions, functions and arrays - Global variables, automatic, static and register variables, recursive functions.	6	15 %

IV	Structures - functions and structures - Arrays of structures - structures within structures, Structures containing arrays. Files - Input & Output, sequential & random access. Basic concepts of object oriented programming - class, objects, constructors and destructors, inheritance (Programs not required)	7	15 %
V	Roots of Transcendental equations – Successive approximations, Regula - Falsi, Newton Raphson Methods, Interpolation-Lagrange interpolation method.	8	20 %
VI	Functional approximation - Fitting straight line & parabola, Numerical Integration - Trapezoidal, Simpson's rule & Gauss quadrature Method. Solution of simultaneous linear algebraic equations – Gauss elimination method. Solution of Partial differential Equation - Finite Difference Method	8	20 %

TEXT BOOKS:

1	Balaguruswamy, Object Oriented programming with C++. Tata Mcgraw Hill., 2008
2	Gerald C. F. and P. O. Wheatley, Applied Numerical Analysis, Pearson Edu., 2004
3	Robert Lafore ., C++ Programming., Sams publishers.,4th Edition, 2001

REFERENCES:

1	Barkakati N., Object Oriented Programming in C++, SAMS, 1991.
2	Kamthane A. M., Object Oriented Programming with ANSI & Turbo C++, Pearson Education, 2009.
3	Lippman S. B. and J. Lajoie, C++ Primer, Pearson Education, 2005.
4	Maria Litvin.and Gary Litvin, C++ for You++, Skylight Publishing, 1998.
5	Ravichandran D., Programming with C++, Tata McGraw Hill, 2007.

PREREQUISITE: nil

COURSE OBJECTIVES

1	To provide adequate knowledge for coding in C++ language
2	To give awareness about the different computational methods and their implementation to analyze basic Engineering problems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Understand the use of algorithms and basic data structure in c++.
2	Analyze C++ looping statements and Array concept to implement programs which helps to solve more complex problems
3	Solve basic engineering problems using C++ language using functions.
4	Solve basic engineering problems using C++ language using structure and union
5	Solve numerical problems related to root finding and its implementation in cpp.
6	Analyze Functional approximation and Partial differentiation using cpp.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO1	PO2	3	Identify best data structure and algorithm to solve a problem.
	PO3	3	Design the solution by applying best data structure and less complex algorithm.

CO2	**PO1**	**1**	Apply mathematical optimizations in looping statements.
	PO2	**3**	Design better algorithm with the help of looping statements.
	PO3	**3**	Design feasible solutions using looping constructs.
CO3	**PO2**	**3**	Analyze the problem to identify modules.
	PO3	**3**	Design the modules using function calls.
	PO4	**3**	Investigate the different parameter passing mechanisms in complex problem scenarios.
CO4	**PO2**	**3**	Analyze the problem to identify the data structure.
	PO3	**3**	Design the data structure for storing the information..
	PO4	**3**	Investigate the different utility mechanisms of memory storage..
CO5	**PO1**	**3**	Mathematical knowledge of root finding..
	PO4	**3**	Design solution based on mathematical aspect of optimization
CO6	**PO1**	**3**	Mathematical knowledge of numerical integration and equation solving.
	PO4	**3**	Design solution based on simultaneous equations.

CO-PSO MAPPING JUSTIFICATION:

CO1	**PSO3**	**2**	Modern tool usage needs understanding about the basic programming.
CO2	**PSO3**	**2**	Modern tools backend working basically depends on cpp compiler
CO3	**PSO3**	**2**	Module development knowledge is needed for understanding tools.
CO4	**PSO3**	**2**	Information storage structure needed for working with data.

CE308 TRANSPORTATION ENGINEERING I

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Transportation Engineering I**	Course code**: CE308**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction to Transportation Engineering, Classification of roads, Typical cross sections of roads in urban and rural area, Requirements and factors controlling alignment of roads, Engineering surveys for highway location- Introduction to geometric design of highways, Design controls and criteria, Design of highway cross section elements.	6	15 %
II	Sight distance, Stopping sight distance, Overtaking sight distance, Design of horizontal alignment and Vertical alignment	7	15 %
III	Introduction to highway materials, design and construction, Desirable properties and testing of road aggregates, bituminous materials and sub grade soil. Flexible and rigid pavements, Factors influencing the design of pavements, CBR method and IRC guidelines for flexible pavements	7	15 %
IV	Introduction to performance grading and superpave, Construction of bituminous pavements, Types and causes of failures in flexible and rigid pavements, Highway drainage. Introduction to Traffic Engineering, Traffic characteristics, Traffic studies and their applications.	6	15 %

V	Types of road intersections, Traffic control devices, Traffic signs, Road markings and Traffic signals, Design of isolated signals by Webster's method. Introduction to Airport Engineering, Aircraft characteristics and their influence on planning of airports, Components of airport, Selection of site for airport	8	20 %
VI	Runway orientation, basic runway length and corrections required, Geometric design of runways, Design of taxiways and aprons, Terminal area planning, Airport markings, Lighting of runway approaches, taxiways and aprons, Air traffic control	8	20 %

TEXT BOOKS:

1	Khanna, S.K. & Justo E.G., Highway Engineering, Nem Chand & Bros., 2000
2	Kadiyali, L. R., Principles of Highway Engineering, Khanna Publishers, 2001
3	Khanna, S. K. & Arora. M. G., Airport Planning and Design, Nemchand& Bros.

REFERENCES:

1	Horonjeff R. & McKelvy, F., Planning and Design of Airports, McGraw Hill, 5e, 2010
2	IRC: 37-2001, Guidelines for the Design of Flexible Pavements, IRC 2001, New Delhi
3	IRC:37-2012, Tentative Guidelines for the Design of Flexible Pavements
4	O' Flaherty, C.A (Ed.)., Transport Planning and Traffic Engineering, Elsevier, 1997
5	Rangwala, S. C. , Airport Engg. Charotar Publishing Co., 16e, 2016
6	Yoder, E. J & Witezak, M. W, Principles of Pavement Design, John Wiley & Sons, 1991

PREREQUISITE: nil

COURSE OBJECTIVES

1	To introduce the principles and practice of Highway Engineering and Airport Engineering.

2	To enable students to have a strong analytical and practical knowledge of geometric design of highways
3	To introduce pavement design concepts, material properties, construction methods and to design highway pavements.
4	To understand the principles of traffic engineering and apply this for efficient management of transportation facilities..

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify the principles and practice of Highway Engineering
2	Design various geometric elements of a highway
3	Determine the characteristics of pavement materials and design flexible pavements
4	Conduct traffic engineering studies and analyze data for efficient management of roadway facilities
5	Plan and design basic airport facilities

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**													**3**	**3**	
CO2		**3**		**3**										**3**	**3**	
CO3		**3**	**3**	**3**		**2**								**2**		
CO4	**3**		**3**	**3**										**2**		
CO5		**3**	**3**	**3**										**3**	**3**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of principle of highway pavement geometrics for different classes of road
CO2	**PO2**	**3**	Analyze various design problems using principle of highway geometric constraints
	PO4	**3**	Using the fundamental knowledge of highway elements, design geometric elements of highway

CO3	PO2	3	With sufficient knowledge of material properties, construction methods, design concepts, pavement design can be done
	PO3	3	Design the pavement structure to meet the specifications with consideration of public health and safety
	PO4	3	With fundamental knowledge of highway elements,design flexible pavement
	PO6	2	Apply the contextual knowledge to assess societal health and safety
CO4	PO1	3	By understanding the principle of traffic engineering, proper management of transportation facility
	PO3	3	Properly analyse the traffic problems to arrive at substantiated conclusion
	PO4	3	By experiment,analysis and interpretation of data to provide valid conclusion
CO5	PO2	3	With sufficient knowledge on ,design concepts,airport pavement design can be done
	PO3	3	Design the pavement structure to meet the specifications with consideration of public health and safety
	PO4	3	With sufficient knowledge on ,design concepts,airport pavement design can be done

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO2	1	The graduates of the programme are able to design various elements of highway
	PSO3	3	The graduates of the programme are able tounderstand various economical,societal and safety factors related to design of highway
CO2	PSO1	3	The graduates of the programme are able tounderstand various economical,societal and safety factors related to geometric design of highway
CO3	PSO1	3	The graduates of the programme are able tounderstand various economical,societal and safety factors related to design of highway

CO4	**PSO1**	**3**	The graduates of the programme are able tounderstand various economical,societal and safety factors related to design of highway
CO5	**PSO2**	**1**	The graduates of the programme are able to design various elements of highway
	PSO3	**3**	The graduates of the programme are able tounderstand various economical,societal and safety factors related to design of airport

HS300 PRINCIPLES OF MANAGEMENT

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Principles of Management**	Course code**:** **HS300**
L-T-P**:** **3-0-0**	Credit**:** **3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction to Management: definitions, managerial roles and functions; Science or Art perspectives- External environment- global, innovative and entrepreneurial perspectives of Management (3 Hrs.)– Managing people and organizations in the context of New Era- Managing for competitive advantage - the Challenges of Management (3 Hrs.)	6	15 %
II	Early Contributions and Ethics in Management: Scientific Management- contributions of Taylor, Gilbreths, Human Relations approach-contributions of Mayo, McGregor's Theory, Ouchi's Theory Z (3 Hrs.) Systems Approach, the Contingency Approach, the Mckinsey 7-S Framework Corporate Social responsibility- Managerial Ethics. (3 Hrs)	6	15 %
III	Planning: Nature and importance of planning, -types of plans (3 Hrs.)- Steps in planning, Levels of planning - The Planning Process. – MBO (3 Hrs.).	6	15 %
IV	Organising for decision making: Nature of organizing, organization levels and span of control in management Organisational design and structure –departmentation,	6	15 %

	line and staff concepts (3 Hrs.) Limitations of decision making- Evaluation and selecting from alternatives- programmed and non programmed decisions - decision under certainty, uncertainty and risk-creative process and innovation (3 Hrs.)		
V	Staffing and related HRD Functions: definition, Empowerment, staff – delegation, decentralization and recentralisation of authority – Effective Organizing and culture-responsive organizations –Global and entrepreneurial organizing (3 Hrs.) Manager inventory chart-matching person with the job-system approach to selection (3 Hrs.) Job design- skills and personal characteristics needed in managers- selection process, techniques and instruments (3 Hrs.)	9	20 %
VI	Leading and Controlling: Leading Vs Managing – Trait approach and Contingency approaches to leadership - Dimensions of Leadership (3 Hrs.) - Leadership Behavior and styles – Transactional and Transformational Leadership (3 Hrs.) Basic control process- control as a feedback system – Feed Forward Control – Requirements for effective control – control techniques – Overall controls and preventive controls – Global controlling (3 Hrs.)	9	20 %

TEXT BOOKS:

1	Harold Koontz and Heinz Weihrich, Essentials of Management, McGraw Hill Companies, 10th Edition.

REFERENCES:

1	Daft, New era Management, 11th Edition, Cengage Learning
2	Griffin, Management Principles and Applications, 10th Edition, Cengage Learning

3	Heinz Weirich, Mark V Cannice and Harold Koontz, Management: a Global, Innovative and Entrepreneurial Perspective, McGraw Hill Education, 14th Edition
4	Peter F Drucker, The Practice of Management, McGraw Hill, New York
5	Robbins and Coulter, Management, 13th Edition, 2016, Pearson Education

PREREQUISITE: nil

COURSE OBJECTIVES

1	To develop ability to critically analyse and evaluate a variety of management practices in the contemporary context
2	To understand and apply a variety of management and organisational theories in practice
3	To be able to mirror existing practices or to generate their own innovative management competencies, required for today's complex and global workplace
4	To be able to critically reflect on ethical theories and social responsibility ideologies to create sustainable organisations

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	know about management and basics management functions and problems
2	evaluate about the early contributions and ethics related to management and its applications
3	develop planning skills, procedures and levels of planning in day to day life activities.
4	Analyzing of organizational models, levels, structure and make the ability to decision making power on students
5	Familiarize the staffing procedures and related functions
6	Analyze the aspects related to leader and its functions, controlling and its applications and need in an organization and daily life

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								3	3			
CO2									3		2	

CO3											2	3
CO4						2					2	
CO5							3		2			
CO6						3	2		2			

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO8**	3	To analyzing the managerial functions and roles it should concerned the related social and cultural issues
	PO9	3	The functions of management are highly correlated with the ethics related to management
	PO9	3	To apply the managerial theories it is necessary to analyze the professional ethics and responsibilities
CO2	**PO11**	2	The application of management theory is related to demonstration knowledge and understanding of theories
	PO11	2	Planning procedures are depends upon the different kinds of managerial practices and roles
CO3	**PO12**	3	Planning is a lifelong learning process which is changed according to programs, and levels of organizations
CO4	**PO6**	2	The decision making is an important tool which is connected to entire work forces
	PO11	2	The organizational pattern, structure and levels determination is depend on the business practices followed by them
CO5	**PO7**	3	The proper communication skills is essential for each staff with co workers
	PO9	2	It is necessary to understand the ethics and responsibilities related to an organization when a staff was appointed
CO6	**PO6**	3	Leader must have the ability to concerned about the group he posses
	PO7	2	Maintaining of effective communication among members is essential
	PO9	2	Understanding of ethics and responsibilities is crucial when a team isformed.

CE362 GROUND IMPROVEMENT TECHNIQUES

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Ground Improvement Techniques**	Course code**: CE362**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction to Engineering Ground Modification- Classification of Ground Modification Techniques- Soil distribution in India- Reclaimed soils- Ground Improvement Potential.	6	15 %
II	Grouting – Aspects – Groutability, Grouting materials, Suspension grouts and solution grouts, Compaction grouting. Procedure and applications of grouting.	6	15 %
III	Chemical stabilization – Granular admixtures, Cement, Lime, Calcium Chloride, Fly Ash, Bitumen, Chemical admixtures. Construction Methods.	6	15 %
IV	Ground Anchors – Applications, types and components, Anchor tests. Rock bolts – Applications and types- Rock bolt action around an excavation. Soil Nailing – construction sequence – analysis of nailed soil	7	15 %
V	Compaction- Moisture Density relationship. Shallow surface compaction-Rollers – operational aspects. Deep Compaction – Explosion- heavy tamping- vibro-compaction and vibro- replacement. Properties of compacted soil, Compaction control tests.	9	20 %

VI	Hydraulic modification- Methods of dewatering- open sumps and ditches, Well point systems, deep well drainage, Vacuum dewatering, Electro osmosis. Design of dewatering for excavations.	8	20 %

TEXT BOOKS/ REFERENCES

1	Manfred. R. Hausmann, Engineering Principles of Ground Modification, McGraw Hill, 1989
2	P. Purushothamaraj, Ground Improvement Techniques ,University Science Press, 2005

PREREQUISITE: CE305 Geo Technical Engineering – II

COURSE OBJECTIVES

1	To impart fundamental knowledge of Ground Improvement Techniques
2	To make capable of choosing and designing the appropriate method of Ground improvement according to site conditions and requirement

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain about types of ground improvement techniques and soil distribution in India
2	Illustrate about various types of grouts and their applications
3	Summarize about types of chemical stabilization and their construction method
4	Explain about Ground Anchors, Rock Bolts and Soil Nailing
5	Discuss about Compaction of soil
6	Develop idea about various methods of dewatering of soil.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3

CO1	3		2				3							3	2	
CO2	3		3				3							3	2	
CO3	3		3				3							3	2	
CO4					3									3		2
CO5	3						3							3	2	
CO6	3						3							3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Fundamental knowledge about soil distribution and select suitable ground improvement techniques.
	PO3	2	Design the improvement methods by environmental considerations
	PO7	3	Improvement methods for sustainable development.
CO2	PO1	3	Based on the knowledge about soil properties fixing suitable improvement method
	PO3	3	Based on the type of soil select appropriate method
	PO7	3	Understand the impact of selected methods in societal and environmental contexts
CO3	PO1	3	Fundamental knowledge about soil distribution and select suitable ground improvement techniques.
	PO3	3	Design the improvement methods by environmental considerations
	PO7		Improvement methods for sustainable development.
CO4	PO5	3	After evaluating existing soil condition select modern techniques
CO5	PO1	3	Fundamental knowledge about soil distribution and select suitable ground improvement techniques
	PO7	3	Improvement methods for sustainable development.
CO6	PO1	3	Fundamental knowledge about soil distribution and select suitable ground improvement techniques
	PO7	3	Improvement methods for sustainable development.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION

CO1	**PSO1**	**3**	Graduates will be able to design suitable method by conducting lab experiments
	PSO2	**2**	Able to select suitable method based on the societal and safety factors
CO2	**PSO1**	**3**	Graduates will be able to design suitable method based on soil conditions
	PSO2		Able to select suitable method based on the societal and safety factors
CO3	**PSO1**	**3**	Graduates will be able to design best method for improvement
	PSO2	**1**	Able to select suitable method based on the societal and safety factors
CO4	**PSO1**	**3**	Graduates will be able to design best method for improvement
	PSO3	**2**	Apply modern methods for improvement
CO5	**PSO1**	**3**	Graduates will be able to design best method for improvement
	PSO2	**2**	Able to select suitable method based on the societal and safety factors
CO6	**PSO1**	**3**	Graduates will be able to design best method for improvement
	PSO2	**2**	Able to select suitable method based on the societal and safety factors

CE374 AIR QUALITY MANAGEMENT

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Air Quality Management**	Course code**:** **CE374**
L-T-P**:** **3-0-0**	Credit**:** **3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction- Components of Environment- Definition –Air Pollution- History of air pollution episodes-Various Sources of Air pollution – Air Pollutants- Types of Air Pollutants	6	15 %
II	Effect of air pollutants on health, vegetation, animals and materials and environment, Green house effect - Indoor Air Pollution, sources of indoor air pollutants	6	15 %
III	Meteorological aspects of Air Pollutant Dispersion - Temperature and Pressure relationships-Atmospheric Stability- Temperature Lapse Rate- Inversions- Types, Plume behavior	7	15 %
IV	Dispersion of Air pollutants-Plume dispersion theory-Gaussian plume model (Derivation not required)-Assumptions-Advantages and Disadvantages- Pasquill's stability curves , Dispersion problems involving point source and line source - Estimation of plume rise.	7	15 %

V	Air Quality monitoring - Ambient air sampling - Collection of gaseous air pollutants-Collection of particulate Pollutants- Ambient Air Quality standards	8	20 %
VI	Control of Air Pollutants- Particulate emission control-methods, Scrubbing-Cyclones- Filtration-Electrostatic Precipitation-Gaseous emission control-adsorption, absorption, thermal methods	8	20 %

TEXT BOOKS:

1	C.S.Rao, "Environmental Pollution Control Engineering", New Age International Pub., 2006
2	M.N. Rao & H.V.N Rao ,Air Pollution, Tata McGraw Hill Co. Ltd, Delhi, 1990.
3	Peavy H S, Rowe, D.R. Tchobanaglous "Environmental Engineering" McGraw Hill Education, 1985

REFERENCES:

1	Chhatwal G.R, Encyclopedia of Environmental Pollution and Control, Volumes 1,2,3, Anmol Publications, 1996
2	J. R. Mudakavi, Principles and Practices of Air Pollution Control and Analysis, IK International Pvt Ltd, 2012
3	Perkins H.C, "Air Pollution" McGraw Hill Publications, 2004
4	S C Bhatia, Textbook of Air Pollution and Its Control , Atlantic publishers, 2007
5	S P Mahajan, Air Pollution Control, Common Wealth of Learning, Canada, Indian Institute of Science, Bangalore, 2006
6	Stern.A, "Air Pollution" (Volume I ,II & III) ,Academic Press New York, 1962

PREREQUISITE: nil

COURSE OBJECTIVES

1	To understand the various forms of air pollutants and their effects on human and environment
2	To understand the basic idea of meteorological aspects of air pollutant dispersion and theories associated with it.

3	To know various methods used for air quality monitoring
4	To know various methods of controlling air pollutants

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Acquire knowledge about components of environment, history of air pollution, sources of air pollution and air pollutant types.
2	Realize about effect of air pollutants, indoor air pollution and green house effect.
3	Grasp meteorological aspects of air pollutant dispersion.
4	Learn about dispersion of air pollutants in the atmosphere.
5	Know about different methods adopted for air quality monitoring.
6	Learn about different methods or devices adopted for control of air pollutants.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**2**	**2**					**3**								**3**	
CO2	**2**	**2**					**3**								**3**	
CO3	**3**					**1**	**2**								**2**	
CO4	**3**					**1**	**2**								**2**	
CO5	**2**					**1**	**2**								**2**	
CO6	**2**					**1**	**2**								**2**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**2**	Apply the knowledge of environmental scienceto identify major pollutant types and their effects.
	PO6	**2**	Apply reasoning information with regard to health and safety
	PO7	**3**	Discuss air pollution, sources and effects with respect to sustainability
CO2	**PO1**	**2**	Apply the knowledge of environmental science to identify major pollutant types and their effects.
	PO6	**2**	Apply reasoning information about indoor air pollution and effects of pollutants with regard to health and safety

	PO7	**3**	Discuss effects of air pollution with respect to sustainability
CO3	**PO1**	**3**	Apply the knowledge of science in the meteorological study of air pollution
	PO6	**1**	Grasp knowledge about meteorology of pollution beneficial for the society
	PO7	**2**	Apply knowledge to explain meteorology of air pollution that will be beneficial for the society
CO4	**PO1**	**3**	Apply the knowledge of mathematics and science in the air pollutant dispersion
	PO6	**1**	Grasp knowledge of air pollutant dispersion beneficial to society
	PO7	**2**	Discuss about dispersion model as efficient tool for assessing pollutant concentration
CO5	**PO1**	**2**	Apply the knowledge of science in monitoring air pollutants
	PO6	**1**	As a powerful procedure for keeping air quality within the limit
	PO7	**2**	Apply knowledge to explain monitoring methodologies that will be beneficial for environment
CO6	**PO1**	**2**	Apply the knowledge of science in understanding different methods adopted for air pollution control
	PO6	**1**	As a powerful procedure for keeping air quality within the limit
	PO7	**2**	Discuss the methods of control of pollution as an aid for keeping sustainability

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO2**	**3**	Have a broad idea about basic elements of atmosphere and environment
CO2	**PSO2**	**3**	Have an understanding about effects and indoor air pollution
CO3	**PSO2**	**2**	Have a broad idea about dispersion of air pollutants and factors affecting dispersion
CO4	**PSO2**	**2**	Have a brief idea about plume models and understanding its importance as a tool to analyse the status of air pollution
CO5	**PSO2**	**2**	Have a broad idea about monitoring methods which is important for maintaining air quality

CO6	**PSO2**	**2**	Have a broad idea about basic principle of different methods adopted for air pollution control

CE332 TRANSPORTATION ENGINEERING LAB

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Transportation Engineering Lab**	Course code**:** **CE332**
L-T-P**:** **0-0 -3**	Credit**:** **1**

SYLLABUS:

CONTENTS

List of Experiments (All experiments shall be conducted as per BIS/ASTM/AASHTO procedures)

I. Tests on aggregates

1. Aggregate crushing value
2. Aggregate impact value
3. Los Angeles abrasion value
4. Shape tests-Flakiness index and Elongation index
5. Angularity of course aggregates and fine aggregates
6. Specific gravity and water absorption of course aggregate
7. Stripping value of road aggregates
8. Dry Packing characteristics of aggregates (ASTM C29/ C29 M – 97)

II. Test on soil

1. California Bearing Ratio test (Soaked and Un-soaked CBR)
2. Dynamic cone penetration test (ASTM D6951 (2015) procedure)

III. Tests on bitumen

1. Penetration value of bitumen
2. Softening point of bitumen

3. Ductility of bitumen

4. Flash and Fire point of bitumen

5. Measurement of mixing and compaction temperature of bitumen (Brookfield viscometer)

(The test was previously written in the draft syllabus as Viscosity test on bitumen, but we have specified it)

IV.Test on bituminous mixes

1. Determination of theoretical specific gravity of loose mix and bulk specific gravity of compacted mix (ASTM D2041, ASTM D1188)

2. Moisture sensitivity test of bituminous mixes (AASHTO T283 procedure)

V. Functional evaluation of pavements

1. Use of MERLIN apparatus to determine road roughness

REFERENCES:

1	L .R. Kadiyali, Principles and Practices of Highway Engineering, Khanna Publishers, 2009
2	MoRTH (2013) Specification for Road and bridge works (5th revision)
3	MS-2 manual (2015) Seventh edition, Asphalt Institute.
4	S. K. Khanna, C. E. G. Justo, A Veeraragavan, Highway Engineering, Khanna Publishers, 10e.

PREREQUISITE: CE 308 Transportation Engineering I

COURSE OBJECTIVES

1	To enable the students to conduct different tests to find various properties of aggregates, bitumen and soil subgrade and hence to assess their suitability in pavement construction.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Determine the properties of aggregates and check their suitability in pavement construction
2	Assess various properties of bitumen and bituminous mixes
3	Determine the strength of soil and assess their suitability in pavement constructions

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3						1	1					3		
CO2	3	3						1	1					3		
CO3	3	3						1	1					3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Knowledge of basic properties of aggregate is essential to select suitable pavement material
	PO2	3	Analyse the properties and behavior to reach conclusions about the suitability of aggregate for pavement construction
	PO8	1	Has to follow professional ethics in laboratory sessions
	PO9	1	Conduct laboratory experiments as a team work
CO2	PO1	3	Knowledge of basic properties of bitumen and bituminous mixes are essential to assess their quality as a pavement material
	PO2	3	Analyse the properties and behavior of bitumen to reach conclusions about the suitability as a construction material
	PO8	1	Has to follow professional ethics in laboratory sessions
	PO9	1	Conduct laboratory experiments as a team work
CO3	PO1	3	Basic knowledge about the subgrade strength of soil is essential to design a pavement
	PO2	3	Analyse the subgrade strength of soil by using California Bearing Ratio Test to evaluate and design a pavement
	PO8	1	Has to follow professional ethics in laboratory sessions
	PO9	1	Conduct laboratory experiments as a team work

CO-PSO MAPPING JUSTIFICATION:

CO1	PSO 1	3	Graduates will have knowledge about the basic properties of aggregates used for road construction

CO2	**PSO 1**	**3**	Graduates will have knowledge about the basic properties of bitumen and bituminous mixes used as pavement materials
CO3	**PSO 1**	**3**	Graduates will have a knowledge to assess the subgrade strength of soil

CE334 COMPUTER AIDED CIVIL ENGINEERING LAB

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Computer Aided Civil Engineering Lab**	Course code**: CE334**
L-T-P**: 0-0-3**	Credit**: 1**

SYLLABUS:

CONTENTS

List of Experiments :

1. Structural Drawings for

a) Slabs and Beams

i. One Way / Two way Slab/Continuous Slabs

ii. Singly reinforced /Double reinforced Beams

iii. Continuous / Flanged Beams

b) Stair Case (Doglegged and Tread and Riser Type)

c) Foundations (Isolated and Combined Rectangular)

II Analysis and design of steel and RCC elements using STAAD/SAP 2000/ ETABS/any FEM software package.

a) Continuous and Cantilever beams

b) Plane truss and Frames

III Use of Project Management Software (MS Project/Primavera)

a) Preparation of Bar Chart/Gantt Charts/CPM/PERT Charts and finding Critical Path

b) Practice on Resource allocation (and Project Monitoring(Cost and Time)

IV. Conduct of Survey camp using Total Station (minimum 3 days duration) and its plotting.

TEXT BOOKS/ REFERENCES

1	N Krishna Raju, Structural Design and Drawing, Second Edition, Universities Press (India), Private Limited, Hyderabad, 2009
2	Reference Manual of the Relevant Software
3	Satheesh Gopi, Dr. R Sathikumar, N Madhu, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson Education India, 2006
4	AutoCAD Essentials, Autodesk official Press, John Wiley & Sons, US, 2015

PREREQUISITE: CE231 Civil Engineering Drafting Lab

COURSE OBJECTIVES

1	To introduce the fundamentals of Civil Engineering drafting and drawing.
2	To familiarize with the FEA software packages for analysis and Design of structures
3	To understand the Total Station data transfer and interpretation
4	To enable the usage of Project Management Software

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The students are expected to accomplish the skills for the use of Civil Engineering Drafting software.
2	The students are expected to accomplish the abilities for the use of Civil Engineering Analysis software.
3	The students are expected to accomplish the abilities for the use of Civil Engineering Project Management Software.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	-	-	-	-	**3**	-	-	-	-	-	-	**3**		**3**	-	**1**
CO2	-	-	**3**	-	**3**	-	-	-	-	-	-	**3**		**3**	-	**1**
CO3	-	-	-	-	**3**	-	-	-	-	-	**3**	**3**		**3**	-	**1**

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO5	3	Students can create and apply appropriate techniques and innovations using Civil engineering drafting software like AutoCAD in the planning and modeling of civil engineering activities.
	PO12	3	Students can attain the ability to engage in the broadest context of technological change and in other civil engineering practices by knowing the drafting of civil engineering drawings with short time.
CO2	PO2	3	Students will be able to solve for analyzing structural components like beam, column etc with consideration for the public health and safety, and the cultural, societal, and environmental considerations by analyzing it using civil engineering designing software.
	PO5	3	Students can apply ideas and techniques using Civil engineering analyzing software like STAAD.Pro in the designing and estimation of civil engineering practices.
	PO12	3	Students can attain the ability to engage in all civil engineering practices by experiencing of civil engineering structural designing using computer aided designing software.
CO3	PO5	3	Students can apply ideas and techniques in all Civil engineering Project management by practicing software like MSP.
	PO11	3	Students can demonstrate knowledge and understanding of engineering and management principles using computer aided software and can apply these to one's own work, as a member and leader in a team.
	PO12	3	Students have the ability to engage independently and as a team member of any civil engineering project management in the broadest context of technological change.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates shall demonstrate knowledge in the drafting of civil engineering infrastructures using computer aided software like AutoCAD with short period of time.

	PSO3	**1**	Graduates will demonstrate ability to function within modern computer aided software AutoCAD and can apply it in own working practices.
CO2	**PSO1**	**3**	Graduates shall demonstrate knowledge in the analysis of civil engineering infrastructures like beam, column, and slab etc using computer aided software like STAAD.Pro with short period of time.
	PSO3	**1**	Graduates will demonstrate ability to function within modern computer aided software STAAD.pro and can apply it in own working practices for analyzing various civil engineering structures.
CO3	**PSO1**	**3**	Graduates shall demonstrate knowledge in the civil engineering project management using computer aided software and can apply these to one's own work, as a member and leader in a project management team.
	PSO3	**1**	Graduates will demonstrate ability to function within computer aided project management software like MSP & have the ability to engage independently and as a team member of any civil engineering project management.

CE352 COMPREHENSIVE EXAMINATION

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Comprehensive Examination**	Course code**: CE352**
L-T-P**: 0-1-1**	Credit**: 2**

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To assess the comprehensive knowledge gained in basic courses relevant to the branch of study
2	To comprehend the questions asked and answer them with confidence

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify the fundamental aspects of any engineering problem/situation and give answers in dealing with them

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO 1	3	3	3	0	0	0	1	0	0	2	0	2		**3**	**1**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Comprehensive knowledge gained from mathematics,science, Engineering fundamentals will contribute in solving complex engineering problem
	PO2	3	Students will be able to identify, formulate, review research literature and analyze complex engineering problems
	PO3	3	Comprehensive knowledge gained in basic courses can utilize in design and develop solutions for complex engineering problems
	PO7	1	Comprehensive knowledge gained in Basic Engineering courses will enable the student to have an impact on the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
	PO10	3	Students will able to Communicate effectively with the engineering Community
	PO12	2	The student will become aware of the need for lifelong learning and the continued upgrading of technical knowledge

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates can demonstrate sound knowledge in different aspects of civil engineering
	PSO2	1	Graduates will get a broad understanding of different factors involved in civil engineering field

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER 7

CE 401 DESIGN OF STEEL STRUCTURES

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Design of Steel structures**	Course code**: CE 401**
L-T-P**:4-0-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to steel and steel structures, properties of steel, structural steel sections. Introduction to design: Design loads and load combinations, limit state design concepts. Connections bolted and welded (direct loads)	9	15
II	Tension members-Types of sections – net area- design of tension members- concept of shear lag-use of lug angle-connections in tension members	9	15
III	Compression members- design of struts- solid and built up columns for axial loads-- design of lacings and battens-column bases- slab base – gusseted base	10	15
IV	Design of beams- laterally restrained and unrestrained – simple and compound beams- plate girders subjected to uniformly distributed loads – design of stiffeners.	9	15
V	Design of roof trusses- types-design loads and load combinationsassessment of wind loads- design of purlins. Moment resistant/Eccentric connections (in plane and out of plane)	10	20
VI	Design of timber structures: types of timber - classification - allowable stresses-design of beams-flexure, shear, bearing and deflection considerations-Design of columns. Design of composite beam sections with timber and steel	9	20

TEXT BOOKS:

1	L S Jayagopal, D Tensing., Design of steel structures, S Chand & Company, 2015
2	S K Duggal., Limit State design of steel structures, Tata McGraw Hill, 2010
3	Subramanian N, Design of steel Structures, Oxford University Press, 2011

REFERENCES:

1	P. Dayaratnam., Design of Steel Structures ,Wheeler Publishing, 2003
2	Punmia B. C., Jain A. K. and Jain A. K., Design of Steel Structures, Laxmi Publications (P) Ltd, 2017
3	Raghupathi, Steel Structures, Tata McGraw Hill, 2006
4	Ramchandra S and Virendra Gehlot, Design of Steel Structures Vol. II, Standard Book House, 2007
5	V L Shah & Veena Gore, Limit State Design of steel Structures , Structures Publications, 2009
6	William T Segui., Steel Design , Cenage Learning, 6e, 2017
7	IS 800 – 2007, Code of practice for Structural steel design, BIS

PREREQUISITE: CE202 Structural Analysis II

COURSE OBJECTIVES:

1	To introduce the limit state design of steel structural components subjected to bending, compression and tensile loads including the connections
2	To enable design of structural components using timber

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Design steel connections- welded and bolted
2	Design tensile stressed members as per IS 800-2007
3	Analyze and design columns for axial load
4	Design of beam- laterally supported and unsupported
5	Quantify the loads on truss and design of purlins
6	Design of timber structural components

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2	2											3		
CO2	2	2	2											3		
CO3	3	3	3											2		
CO4	3	2	2											3		
CO5	3	2	1											2		
CO6	3	3	2											3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Applying the basic knowledge of engineering mechanics and mathematics to do analyze and design joints in steel structures.
	PO2	2	Analyzing simple and complex joints with the help of engineering mechanics basics.
	PO3	1	Finding the most suitable solutions considering both technical and economical aspects.
CO2	PO1	2	Understanding nature of tension members with the help of material science.
	PO2	2	Analyzing behavior of steel sections under the action of tension using concepts of material science.
	PO3	1	Designing a steel section which is safe and viable to carry design load.
CO3	PO1	3	Applying concepts of mathematics and mechanics of solids, identifying the response of axial load carrying steel members.
	PO2	3	Formulating mathematical equations which express the nature of steel columns
	PO3	3	Designing steel sections to carry axial compression load.
CO4	PO1	3	Use of knowledge of material science and mathematics to understand the behavior of structure.
	PO2	2	Identifying best mathematical solution to express response of flexural member
	PO3	2	Designing flexural members made up of steel considering all aspects
CO5	PO1	3	Understanding steel truss elements
	PO2	2	Analyzing all components of truss by using first principles of mathematics and material science
	PO3	1	Designing struts and tie members
CO6	PO1	3	With the help of basic engineering ideas assessing behavior of timber sections
	PO2	3	Formulating mathematical equations which express the nature of timber sections under the action of various types of loads
	PO3	2	Appropriate designs are obtained considering guide lines given by Indian Standards

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Completion of this course will help students design steel joints for all kinds of load conditions
CO2	**PSO1**	**3**	This course make students to analyze and design steel tension members
CO3	**PSO1**	**2**	Successful completion of this course will help students to design compression members using structural steel
CO4	**PSO1**	**3**	Completion of this course will help students design steel beams for all load conditions
CO5	**PSO1**	**3**	Completion of this course will help students design steel truss members under the action of wind and earth quake loads
CO6	**PSO1**	**2**	Completion of this course will help students design timber sections

CE 403 STRUCTURAL ANALYSIS -III

COURSE INFORMATION SHEET:

Program: **Civil Engineering**	Degree :**B-Tech**
Course**:Structural Analysis III**	Course code**: CE 403**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Approximate Methods of Analysis of Multistoried Frames: Analysis for vertical loads-substitute frames-loading condition for maximum hogging and sagging moments in beams and maximum bending moment in columns- wind load analysis of multistoried frames – portal method and cantilever method for lateral load analysis	6	15
II	Matrix analysis of structures: static and kinematic indeterminacy force and displacement method of analysis-definition of flexibility and stiffness influence coefficients Concepts of physical approach	6	15
III	Flexibility method: flexibility matrices for truss and frame elements-load transformation matrix-development of total flexibility matrix of the structure-analysis of simple structures-plane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects	7	15
IV	Stiffness method: Development of stiffness matrices by physical approach-stiffness matrices for truss and frame elementsdisplacement transformation matrix-analysis of simple structuresplane truss and plane frame-nodal loads and element loads-lack of fit and temperature effects	7	15
V	Introduction to direct stiffness method-Rotation of axes in two dimensions, stiffness matrix of elements in global co-ordinates from element co-ordinates- assembly of load vector and stiffness matrix, solution of two span continuous beam-single bay single storey portal frame.	8	20
VI	Structural dynamics-introduction-degrees of freedom-single degree of freedom subjected to harmonic load -linear systems-equation of motion, D'Alembert's principle-damping- free response of damped and undamped systems- logarithmic decrement- transient and steady state responses, Dynamic magnification factor – Vibration isolation –Concept of two degree of freedom systems (No derivation and numerical problems)	8	20

TEXT BOOKS:

1	G S Pandit and S P Gupta, Structural analysis a Matrix approach, McGraw Hill Education (India), 2e, 2008
2	Gere, J.M. and William Weaver, Matrix Analysis of framed structures, CBS Publishers, 1990
3	Kenneth M Leet, Chia Ming Uang, Anne M Gilbert, Fundamentals of structural analysis, Tata McGraw Hill Pvt Ltd., 4e, 2010
4	Reddy C.S., Basic structural analysis, Tata McGraw Hill, third edition, 3e, 2012

REFERENCES:

1	Anil. K. Chopra, Dynamics of structures, Pearson Education/ Prentice Hall India, 5e, 2016
2	Clough R.W. and Penzein, J., Dynamics of structures, Tata McGraw Hill, 1995
3	Madhujith Mukhopadhyay and Abdul Hamid Sheikh, Matrix and Finite Element Analysis of Structures, Ane Books India, 2009
4	Mario Paz , Structural Dynamics: Theory & Computation, 2e, CBS Publishers, 2004
5	Rajasekharan. S. and Sankarasubramanian G., Computational structural Mechanics, PHI, 2009
6	Wang C.K., Matrix method of structural analysis, International Text book company, 1970

PREREQUISITE: 1. CE203 Structural Analysis - I

2. CE303 Structural Analysis - II

COURSE OBJECTIVES:

1	To enable the students to have a comprehensive idea of matrix structural analysis with emphasis on the relative advantages of the flexibility method and the stiffness method
2	To enable the students to visualize structural dynamics problems with a proper blend of structural analysis and vibration theory

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Analyze structures using approximate method such as substitute frame methods, portal frame method and cantilever method.
2	Identify the structures with static and kinematic indeterminacies and to describe the difference between force and displacement method
3	Analyze trusses, continuous beams and rigid frames using flexibility method
4	Analyze trusses, continuous beams and rigid frames by stiffness method.
5	Illustrate Finite element procedures by direct stiffness method.
6	Use the basics of structural dynamics and analyze the response of SDOF systems

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2	3												3		
CO2	3													3		
CO3	2	3												3		
CO4	2	3												3		
CO5	2	3												3		
CO6	3	3												3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Identification of determinacy of structures using fundamental mathematics
	PO2	3	Analyze the structure for horizontal loads using approximate methods such as cantilever method, portal frame method and substitute frame method
CO2	PO1	3	Identification of static and kinematic indeterminacy of structures using fundamental mathematics
CO3	PO1	2	Identification of determinacy of structures using fundamental mathematics
	PO2	3	Analysis of structure by flexibility method for different support , load and physical conditions
CO4	PO1	2	Identification of determinacy of structures using fundamental mathematics
	PO2	3	Analysis of structure by stiffness method for different support , load and physical conditions
CO5	PO1	2	Identification of determinacy of structures using fundamental mathematics
	PO2	3	Analysis of structure by direct stiffness method for different support and load conditions
CO6	PO1	2	Identification of time period, frequency etc by using engineering fundamentals.
	PO2	3	Analysis of response of single degree of freedom system for damped and undamped, forced and free conditions.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates will be able to identify and analyze the multistoried structure for wind loads and earthquake loads by using approximate method
CO2	PSO1	3	Graduates will be able to identify the structures with static and kinematic indeterminacies and force and displacement method of analysis
CO3	PSO1	3	Graduates will be able to identify and analyze the multistoried structure for vertical loads by using flexibility method
CO4	PSO1	3	Graduates will be able to identify and analyze the multistoried structure for vertical loads by using stiffness method
CO5	PSO1	3	Graduates will be able to identify and analyze the multistoried structure for vertical loads by using direct stiffness method

CO6	**PSO1**	**3**	Graduates will have a thorough knowledge in structural dynamics and will be able to analyze the response of a single degree of freedom system.

CE 405 ENVIRONMENTAL ENGINEERING- I

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Environmental Engineering I**	Course code**: CE 405**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction of environment- sources of water supply-Water demand, quantification of water demand through population forecasting – Factors affecting consumption-Fluctuations in demand	7	15
II	Types of intakes-Conveyors, pumps and location of pumping station Quality of water - Drinking water standards - Physical, chemical and biological analysis	6	15
III	Treatment of water-Theory and principles of Sedimentation tanks Stoke's law-Types of settling (Type I & Type II only)-Coagulation Mixing-Flocculation, Design of Sedimentation tanks (circular and rectangular)-Clariflocculators	7	15
IV	Filtration-Types of filters- Working and Design of Rapid and Slow sand filters. Loss of head in filters, Pressure filters	7	15
V	Disinfection of water - Methods, Chlorination-Types, Factors affecting - Chlorine demands. Miscellaneous treatment-Ion exchange, Lime-soda process, Electro dialysis - Colour, Taste and Odour removal-Adsorption-Aeration-Fluoridation-Defluoridation	7	20
VI	Lay out of water distribution network-Methods of distribution-Hardy cross method-Equivalent pipe method-Pipe appurtenances.	8	20

TEXT BOOKS:

1	B.C Punmia, "Water Supply Engineering", Laxmi Publications Pvt. Ltd., 2016
2	G S Birdie, Water Supply and Engineering, Dhanapat Rai Publishing Company, 2014
3	P.N. Modi, "Water Supply Engineering", Standard Book House, NewDelhi
4	Peavy H S, Rowe, D.R. Tchobanaglous "Environmental Engineering" Mc GrawHill Education, 1984
5	S.K.Garg, "Water Supply Engineering", Khanna Publishers. 2010

REFERENCES:

1	K N Dugal, Elements of Environmental Engineering, S Chand and Company Pvt Ltd, 2007
2	Mackenzie L Davis, Introduction to Environmental Engineering, McGrawhill Education (India), 2012
3	Metcalf & Eddy , "Waste Water Engineering", Tata Mc Grawhill Publishing Co Ltd, 2003
4	P Venugopala Rao, Environmental Engineering, PHI Learning Pvt Ltd, 2002
5	Subhash Verma, Varinder Kanwar, Siby John, Water supply Engineering, Vikash Publishing, 2015

PREREQUISITE: CE203 Fluid Mechanics -I

COURSE OBJECTIVES:

1	To study the significance of water resources and the factors affecting the quality and quantity of water
2	To study the various types of treatment techniques adopted for public water supply system

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain water demand, quantification and forecasting methods
2	Describe intake structures and water characteristics
3	Define sedimentation process and design of sedimentation tank
4	Define filteration,working and design of various types of filters
5	Describe disinfection ,methods and miscellaneous treatments
6	Analyse methods of water distribution networks and layouts

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2	1												2	1	
CO2	2						2								2	
CO3			3			2	2							3	2	
CO4	1		3											3	1	
CO5	1						2								1	
CO6		3												3	1	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	The students will be able to understand pollutants affecting water supply
	PO2	1	The students will be able to forecast population
C02	PO1	2	The students will get knowledge regarding different intake structures
	PO7	2	The students will get knowledge regarding different water characteristics and their environmental contexts
CO3	PO3	3	The students will be able to Design components of sedimentation tank
	PO6	2	The students will get knowledge regarding sedimentation process
	PO7	2	The students will get knowledge regarding Environmental and sustainable sedimentation and its process
CO4	PO1	1	The students will get knowledge regarding filtration and types of filters
	PO3	3	The students will be able to Design various types of filters
CO5	PO1	1	The students will be able to understand miscellaneous process
	PO7	2	The students will get knowledge regarding Disinfection and miscellaneous process
CO6	PO2	3	The students will be able to analyse water distribution networks

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Graduates will be able to investigate population
	PSO2	**1**	Graduates will get a brief idea about water demand
CO2	**PSO2**	**2**	Graduates will be able to do get a sound knowledge about intake structures and water characteristics
CO3	**PSO1**	**3**	Graduates will be able to design sedimentation tank units
	PSO2	**2**	Graduates will have a broad understanding about environmental friendly and sustainable sedimentation process
CO4	**PSO1**	**3**	Graduates will be able to design Filtration tank units
	PSO2	**1**	Graduates will have a broad understanding about filters and filtration process
CO5	**PSO2**	**1**	Graduates will have a broad understanding about environmental friendly methods of disinfection
CO6	**PSO1**	**3**	Graduates shall analyse water distribution networks and layouts
	PSO3	**1**	Graduates will have a broad understand about water distribution network layouts

CE 407 TRANSPORTATION ENGINEERING - II

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Transportation Engineering II**	Course code**: CE 307**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Railways in India: Role of Indian Railways in National Development – Railways for Urban Transportation – Modern developments- LRT & MRTS, tube railways, high speed tracks. Alignment- basic requirements and factors affecting selection, Component parts of a railway track - requirements and functions - Typical cross-section	7	15
II	Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks . Sleepers – Functions, Materials, Density , Ballast less Tracks. Geometric design of railway track: Horizontal curves, radius – super elevation -cant deficiency - transition curves - gradients - different types - Compensation of gradients.	7	15
III	Railway operation and control: Points and Crossings – Design features of a turnout – Details of station yards and marshalling yards – Signaling, interlocking of signals and points - Principles of track circuiting - Control systems of train movements – ATC, CTC – track circuiting	6	15
IV	Maintenance:- Introduction to track maintenance, Items of track maintenance, packing and over hauling, screening Railway accidents: Human and system contribution to catastrophic accidents, Human Factors in Transport Safety	6	15
V	Tunnel Engineering: Tunnel - sections - classification - tunnel surveying -alignment, transferring centre, grade into tunnel – tunnel driving procedure - shield method of tunneling, compressed air method, tunnel boring machine, Tunnel lining,	8	20

	ventilation - lighting and drainage of tunnels		
VI	Harbours– classification, features, requirements, winds and waves in the location and design of harbours. Break waters - necessity and functions, classification, alignment, design principles, forces acting on break water – construction, general study of quays, piers, wharves, jetties, transit sheds and warehouses - navigational aids - light houses, signals - types - Moorings Docks – Functions and types - dry docks, wet docks – form and arrangement of basins and docks	8	20

TEXT BOOKS:

1	Mundrey J. S, Railway Track Engineering, Tata McGraw Hill, 2009
2	Rangawala, S.C. , Railway Engineering, Charotor Publishing House
3	Rao G. V, Principles of Transportation and Highway Engineering, Tata McGrawHill, 1996
4	Srinivasan,R., Harbour, Dock & Tunnel Engineering, Charotor Publishing House, 28e, 2016

REFERENCES:

1	Bindra, S.P., A course in Docks and Harbour Engineering, Dhanpat Rai& Sons
2	Chandra, S. and Agarwal, M.M. ,Railway Engineering, Oxford University Press, New Delhi, 2008
3	Saxena, S. C and Arora, S. P, Railway Engineering, Dhanpat Rai& Sons, 7e, 2010
4	Subhash C. Saxena, Railway Engineering, Dhanpat Rai& Son

PREREQUISITE: CE308 Transportation Engg.-I

COURSE OBJECTIVES:

1	To set a solid and firm foundation in Railway engineering, including the history development, modern trends, maintenance, geometric design and safety of railways.
2	To introduce dock, harbour and tunneling

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain the geometric parameters of a railway track
2	Analyze a turnout
3	Describe various safety issues in railway engineering
4	Describe various tunnel driving procedures
5	Explain the functions of docks
6	Explain various navigational aids

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2	1											3		
CO2	3	2	1											3		
CO3	3	2													2	
CO4	3	2												1		
CO5	3	1												1		
CO6	3	2	1											1		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	2	The students will be able to identify, formulate and analyze of transportation problems using principles of engineering sciences
	PO3	1	The students will be able to apply the knowledge to assess transportation engineering problems
CO2	PO1	3	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	2	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO3	1	The students will be able to apply the knowledge to assess transportation engineering problems
CO3	PO1	3	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problem

	PO2	**2**	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
CO4	**PO1**	**3**	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	**2**	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
CO5	**PO1**	**3**	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences
	PO2	**1**	The students will be able to apply the knowledge to assess transportation engineering problems
CO6	**PO1**	**3**	The students will be able to apply the knowledge of engineering fundamentals to the solution of complex transportation engineering problems
	PO2	**2**	The students will be able to identify, formulate and analyse of transportation problems using principles of engineering sciences

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	The graduates of the program me are able to analyze and design geometric pattern of railway track.
CO2	**PSO1**	**3**	The graduates of the program me are able to analyze and design turn out of railway track.
CO3	**PSO2**	**2**	The graduates of the program me are able understand the societal and safety factors involved in railway
CO4	**PSO1**	**1**	The graduates of the program me are able to analyze various tunnel driving procedure of railway track
CO5	**PSO1**	**1**	The graduates of the program me are able to analyze the functioning of docks.
CO6	**PSO1**	**1**	The graduates of the program me are able to analyze various navigational aids.

CE409 QUANTITY SURVEYING AND VALUATION

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Quantity Survey and Valuation**	Course code**: CE409**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	General Introduction- Quantity Surveying- Basic principles- Types of Estimates - Specifications- purposes and basic principles-general specifications - Detailed specifications- Method of measurement of various items of work. Analysis of rates- Introduction to the use of CPWD data book and schedule of rates- conveyance and conveyance statement -	6	10
II	Preparation of data and analysis of rates for various items of work connected with building construction and other civil engineering structures with reference to Indian Standard Specification	6	10
III	Detailed estimate including quantities, abstract and preparation of various items of works- buildings- centerline method and long wall short wall method- sanitary and water supply works- soak pits, septic tanks, overhead tanks, culverts, Retaining walls, road construction. Bar-bending schedule- preparation of bar-bending schedule for RCC works connected with building construction, culverts and minor irrigation works. 18 50 S	18	50
IV	Valuation - Explanation of terms, types of values, sinking fund, years purchase, Depreciation - Straight line method, constant percentage method, S.F method .Obsolescence. Valuation of real properties-rental method, profit based method, depreciation method. Valuation of landed properties - belting method, development method, hypothecated building scheme method. Rent calculation. Lease and Lease hold property	12	30

TEXT BOOKS:

1	B N Dutta, Estimating and costing in Civil Engineering, USB publishers and distributers Ltd. New Delhi
2	D D Kohli, RC Kohli, A textbook of Estimating and costing, S Chand Publishing, 2011
3	Dr. S. Seetharaman, M. Chinnasamy, Estimation and Quantity Surveying, Anuradha Publications , Chennai

REFERENCES:

1	BS Patil, Civil Engineering contracts and estimates, Universities press
2	V N Vazirani & S P Chandola, Civil engineering Estimating and Costing, Khanna Publishers.
3	IS 1200-1968; Methods of measurement of Building & Civil Engineering works.
4	CPWD data book and schedule of rates

PREREQUISITE: CE334 Computer Aided Civil Engg. Lab

COURSE OBJECTIVES:

1	To have awareness regarding specifications, analysis of rates, analysis etc. in connection with construction
2	To prepare detailed estimate, bar bending schedule of various items of work

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify the quality and quantity of materials, quantity and classes of skilled and unskilled labours and tools and plants required for the project.
2	Analyse the rate of items of work by working out the quantities of different materials and labours required for execution of various items of work.
3	Estimate the quantities, prepare abstract for various items of works- buildings, septic tanks, culverts, roads etc. by drawing up specifications, bar bending schedule and also prepare the schedule of programming of the project
4	Evaluate the value of real and landed property and rent of lease hold property

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1		2												3		
CO2			3											3		
CO3			3											3		
CO4				3										3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO2	2	For carrying out a civil engineering project, quality and quantity of materials and classes of skilled and un skilled labours and tools and plants etc. to be identified
CO2	PO3	3	Exact quantities of items of work and quantities of different materials required for various items of work is essential for the execution of the civil engineering project without wastage of resources
CO3	PO3	3	Estimate report is essential to meet a number of requirements and also to have a clear picture of the project expenditure and to decide upon how and whether to carry out the project and preparation of the schedule of programming of the project for the execution of the civil engineering project without wastage of resources
CO4	PO4	3	Proper analysis and interpretation of the data is essential to prepare valuation report of real and landed property.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates will have knowledge to identify and quantify materials, quantity of class of work
CO2	PSO1	3	Graduates will capable to workout the quantities of different materials required for various items of work and its cost
CO3	PSO1	3	Graduate will be able to estimation different structures
CO4	PSO1	3	Graduates will have a knowledge to do valuation of a property

CE467 HIGHWAY PAVEMENT DESIGN

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Highway Pavement Design**	Course code**: CE467**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to highway pavements, Types and component parts of pavements, Factors affecting design and performance of pavements, Functions and significance of sub grade properties, Various methods of assessment of sub grade soil strength for pavement design Mix design procedures in mechanical stabilization of soils Design of bituminous mixes by Marshall, Hubbard - field and Hveem's methods	6	15
II	Introduction to analysis and design of flexible pavements, Stresses and deflections in homogeneous masses, Burmister's 2 layer and 3 layer theories, Wheel load stresses, ESWL of multiple wheels, Repeated loads and EWL factors	6	15
III	Empirical, semi - empirical and theoretical approaches for flexible pavement design, Group index, CBR, Triaxial, Mcleod and Burmister layered system methods	7	15
IV	Introduction to analysis and design of rigid pavements, Types of stresses and causes, Factors influencing stresses, General conditions in rigid pavement analysis, Warping stresses, Frictional stresses, Combined stresses	7	15
V	Joints in cement concrete pavements, Joint spacings, Design of slab thickness, Design and detailing of longitudinal, contraction and expansion joints, IRC methods of Design	8	20
VI	Introduction to pavement evaluation, Structural and functional requirements of flexible and rigid pavements, Quality control tests for highway pavements, Evaluation of pavement structural condition by Benkelman beam, rebound deflection and plate load tests, Introduction to design of pavement overlays and the use of geosynthetics	8	20

TEXT BOOKS:

1	Yoder and Witezak, Principles of Pavement design, John Wiley and sons, second edition,1975.
2	Yang, Design of functional pavements, McGraw- Hill,1972
3	Khanna S. K. & Justo C. E. G., Highway Engineering, Nemchand & Bros, 9e
4	Hass & Hudson, 'Pavement Management System', McGraw Hill Book Co, 1978

REFERENCES:

1	IRC: 37 - 2001, 'Guidelines for the Design of Flexible Pavements'..
2	IRC: 58 – 2002, 'Guidelines for the Design of Rigid Pavements'.
3	IRC: 37-2012, 'Tentative Guidelines for the Design of Flexible Pavements'.
4	IRC: 58-2011, Guidelines for Design of Plain Jointed Rigid Pavements for Highways

PREREQUISITE: CE208 Geo Technical Engineering - I

COURSE OBJECTIVES:

1	To introduce highway pavements, design concepts and material properties,
2	To understand and enable students to carry out design of bituminous mixes, analyse and design flexible and rigid highway pavements
3	To introduce the concepts of pavement evaluation and rehabilitation

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify the pavement components and design bituminous mixes
2	Analyze and design flexible pavements
3	Analyze and design and rigid pavements
4	Determine the design criteria of pavements by IRC guideline.
5	Evaluate structural condition of pavement

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1		3												3		
CO2		3	3	3										3		
CO3		3	3	3										3		
CO4	3													3	1	
CO5	2		3											3		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO2	3	Designing bituminous mixing by indentifying components of pavements
CO2	PO2	3	Based on analysis of pavement requirement, designing flexible pavement
	PO3	3	Designing an effective pavement system to meet the specifications
	PO4	3	Based on research and experiments, identifying an effective method in pavement design
CO3	PO2	3	Based on analysis of pavement requirement, designing rigid pavement
	PO3	3	Designing an effective pavement system to meet the specifications
	PO4	3	Based on research and experiments, identifying an effective method in pavement design
CO4	PO1	3	Learning IRC guidelines in design of pavement to meet the standards
CO5	PO3	3	After evaluating existing pavement condition, design a new pavement
	PO1	2	Applying knowledge in structural evaluation and design of pavement

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates will be able to design bituminous mixes
CO2	PSO1	3	Graduates will be able to analyse and design flexible pavements
CO3	PSO1	3	Graduates will be able to analyse and design rigid pavements
CO4	PSO1	3	Graduates will be design the pavement based on IRC recommendations
	PSO2	1	Graduates will understand the safety and environmental factors involved in pavement construction
CO5	PSO1	3	Graduates will be able to investigate on existing pavement condition

CE469 ENVIRONMENTAL IMPACT ASSESSMENT

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Environment Impact Assessment**	Course code**: CE469**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	INTRODUCTION: Classification of Pollution and Pollutants, – Evolution of EIA (Global and Indian Scenario)- Elements of EIA — Screening – Scoping - Public Consultation - Environmental Clearance process in India - Key Elements in 2006 EIA(Govt. of India) Notification	6	15
II	AIR POLLUTION: Primary and Secondary Types of Pollutants, sulfur dioxide- nitrogen dioxide, carbon monoxide, WATER POLLUTION: Point and Non-point Source of Pollution, Major Pollutants of Water, Impact of pollutants	6	15
III	SOLID WASTE: Classification and sources of Solid Waste, Characteristics, effects, e waste, : Effects of urbanization on land degradation, pesticide pollution NOISE POLLUTION: Sources of Noise, Effects of Noise, Control measures	7	15
IV	Impacts of pollutants, types, scale of impact-Global, local pollutants. Climate change, Ozone layer depletion, Deforestation, land degradation , Impact of development on vegetation and wild life	7	15
V	Socio-economic impacts - Impact assessment Methodologies Overlays, Checklist, Matrices, Fault Tree Analysis, Event Tree Analysis- Role of an Environmental Engineer- Public Participation	8	20
VI	Standards for Water, Air and Noise Quality - Environmental Management Plan- EIA- Case studies of EIA	8	20

TEXT BOOKS /REFERENCES:

1	A K Srivastava, Environment impact Assessment, APH Publishing, 2014
2	John Glasson, Riki Therivel & S Andrew Chadwick "Introduction to EIA" University College London Press Limited, 2011
3	Larry W Canter, "Environmental Impact Assessment", McGraw Hill Inc. , New York, 1995.
4	Ministry of Environment & Forests, Govt. of India 2006 EIA Notification
5	Rau G J and Wooten C.D "EIA Analysis Hand Book" Mc Graw Hill
6	Robert A Corbett "Standard Handbook of Environmental Engineering" McGraw Hill, 1999

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To know the various types of environmental pollution
2	To make aware the impact due to various types of pollutants and their assessment technique

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain basic elements of EIA procedure
2	Summarize basic aspects of air pollution and water pollution and to point out the impacts associated with the same
3	Discuss basic considerations of solid waste and noise pollution and to explain the impacts associated with the same
4	Explain global environmental issues and to infer impacts associated with them
5	Explain different impact assessment methodologies and role of an environmental engineer
6	Discuss standards for water, air and noise quality and to prepare case studies of EIA

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**	**1**				**2**	**3**								**2**	
CO2	**2**					**1**	**3**								**3**	
CO3	**2**	**1**					**3**								**3**	
CO4	**3**					**2**	**3**								**3**	
CO5	**2**	**2**				**1**	**2**								**2**	**1**
CO6	**1**					**1**	**3**								**3**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	The students will apply the knowledge of science in pollution studies
	PO2	1	The students will Identify the procedure for analysis of the impacts
	PO6	2	The students will apply information with regard to environmental aspects
	PO7	3	The students will explain the need of EIA procedure as an sustainability tool
CO2	PO1	2	The students will apply knowledge of science in air and water pollution study
	PO6	1	The students will be able to apply knowledge to assess the impacts of pollutants on societal and health effects
	PO7	3	The students will discuss and explain the impacts of pollutants
CO3	PO1	2	The students will be able to apply the knowledge of mathematics, science fundamentals to explain solid waste characteristics and noise pollution
	PO2	1	The students will be able to analysis problems associated with solid waste and noise pollution
	PO7	3	The students will understand the impacts of pollutants associated with noise and solid waste
CO4	PO1	3	The students will be able to analyze and interpret about global environmental issues
	PO6	2	The students will be able to explain the importance of global issues in the society
	PO7	3	The students will be able to interpret and explain the impacts of different major environmental issues
CO5	PO1	2	The students will apply the knowledge of science in impact identification
	PO2	2	The students will explain methodologies for the analysis of impacts
	PO6	1	The students will apply information with regard to environmental aspects
	PO7	2	The students will explain the need of EIA methodologies as an sustainability tool
CO6	PO1	1	The students will apply the knowledge of science in explaining quality standards
	PO6	1	The students will apply information with regard to environmental aspects
	PO7	3	The students will explain the need of water quality standards as an sustainability tool

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO2	2	The graduates of the programme will have broad understanding EIA procedure to assess economical, environmental and societal factors
CO2	PSO2	3	The graduates of the programme will have a broad understanding of different types of environmental pollution
CO3	PSO2	3	The graduates of the programme will have a broad understanding of different types of environmental pollution
CO4	PSO2	3	The graduates will have some insights on impacts of pollutants and important environmental phenomena.
CO5	PSO2	2	The graduates of the programme will have broad understanding EIA procedure to assess economical, environmental and societal factors

CO6	**PSO2**	**3**	The graduates of the programme will understand quality standards which is an important factor to be considered in infrastructural development.

CE451 SEMINAR AND PROJECT PRELIMINARY

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Seminar and Project Preliminary**	Course code**: CE451**
L-T-P**:0-1-4**	Credit**:2**

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To develop skills in doing literature survey, technical presentation and report preparation
2	To enable project identification and execution of preliminary works on final semester project

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Develop skills in doing literature survey, technical presentation and report preparation
2	Analyze a current topic of professional interest and present it before an audience
3	Determine an engineering problem, analyse it and propose a work plan to solve it
4	Identify a project and execute its preliminary works on final semester project

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2		2										3	1	3
CO2	3	3		3										3		3
CO3	3	2	3	2					3					3		
CO4	3	3	2	3					3					3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Students could apply the knowledge of various engineering fundamentals to develop skills in doing literature survey, technical presentation and report preparation.
	PO2	2	Students could review research literature for technical presentation and report

			preparation.
	PO4	**2**	Students could use research-based knowledge to identify a project and execute its preliminary works on final semester project
CO2	**PO1**	**3**	Students could apply the knowledge of various engineering fundamentals to analyse a current topic of professional interest
	PO2	**3**	Students could review research literature to analyze a current topic of professional interest and present it before an audience
	PO4	**3**	Students could use research-based knowledge to analyze a current topic of professional interest.
CO3	**PO1**	**3**	Students could apply the knowledge of various engineering fundamentals to identify an engineering problem and analyze it and propose a work plan
	PO2	**2**	Students could review research literature to analyze a problem and prepare work plan.
	PO3	**3**	H Use research-based knowledge and research methods including analysis and interpretation of data to analyze a problem.
	PO4	**2**	Students could use research-based knowledge to analyze a problem and prepare work pan.
	PO9	**3**	Students could function effectively as an individual, and as a member or leader in diverse teams to prepare work plan.
CO4	**PO1**	**3**	Students could apply the knowledge of various engineering fundamentals
	PO2	**3**	Students could review research literature to identify a problem and execute its preliminary works
	PO3	**2**	Use research-based knowledge and research methods including analysis and interpretation of data to identify a problem.
	PO4	**3**	Students could use research-based knowledge to identify a problem and prepare preliminary works..
	PO9	**3**	Function effectively as an individual, and as a member or leader in diverse teams to start preliminary works.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	The graduates of the program are able to develop skills in doing literature survey, technical presentation and preparation and technical communication
	PSO2	**1**	The graduates of the program have a broad understanding in economical ,environmental societal and safety factors involved in infrastructural development
	PSO3	**3**	The graduates of the program will develop an ability to demonstrate with in multidisciplinary teams with competence in modern softwares
CO2	**PSO1**	**3**	The graduates of the program will have a sound knowledge in analyze a current topic of professional interest.
	PSO3	**3**	The graduates of the program will develop an ability to demonstrate with in multidisciplinary teams with competence in modern softwares.
CO3	**PSO1**	**3**	The graduates of the program will be able to determine an engineering problem and analyze it using fundamental mathematics and basic science

CO4	**PSO1**	**3**	The graduates of the program will be able to excute its preliminary work on final semester project using a sound knowledge in analysis, design, laboratory investigation and construction aspects of civil engineering infrastructure.
	PSO2	**2**	The graduates of the program will be able to identify a project by understanding economical ,environmental societal and safety factors involved in infrastructural development

CE431 ENVIRONMENTAL ENGINEERING LAB

COURSE INFORMATION SHEET:

Program:**Civil Engineering**	Degree :**B-Tech**
Course**: Environmental Engineering Lab**	Course code**: CE431**
L-T-P**:0-0-3**	Credit**:1**

List of Experiments:(Minimum 10 experiments are mandatory)

1. To analyse the physical characteristics viz. colour, turbidity, and conductivity of a given water sample and to determine its suitability for drinking purposes
2. To analyse the chemical characteristics of a given water sample viz. pH, acidity, alkalinity for assessing its potability
3. To analyse the chemical characteristics of a given water sample viz. chlorides and sulphates content to assess its suitability for drinking purposes and building construction
4. To determine the Dissolved Oxygen content of a given water sample for checking its potability
5. To determine the available chlorine in a sample of bleaching powder
6. To analyse the various types of solids in a given water sample
7. To determine the BOD of a given wastewater sample
8. To determine the COD of a given wastewater sample
9. To determine the optimum dosage of alum using Jar test
10. To determine the Nitrates / Phosphates in a water sample
11. To determine the iron content of a water sample
12. To determine the MPN content in a water sample and assess the suitability for potability

PRE-REQUISITE: CE405 Environmental Engineering - I

COURSE OBJECTIVES:

1	To equip the students in doing analysis of water and wastewater samples

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Assess the importance of water quality standards
2	Analyze the Dissolved oxygen content in water
3	Measure the chemical characteristics of a given water sample viz. pH, acidity, alkalinity
4	Evaluate the physical characteristics viz. colour, turbidity, and conductivity of a given water sample
5	Estimate the optimum dosage of alum using Jar test
6	Determine the chemical characteristics of a given water sample viz. chlorides, Iron, Available Chlorine and sulphates content to assess its suitability for drinking purposes

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2													3		
CO2	3	3		3										3		
CO3	3	3	2													
CO4	3	3												3		
CO5	3	3												3		
CO6	3	3														

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**2**	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals inferring the quality of water
CO2	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals for dissolved oxygen content in water.
	PO2	**3**	The students will be able to identify, formulate and review research literature for dissolved oxygen content in water reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO4	**3**	The students will be able to use research-based knowledge and research methods including design of experiments, analysis and interpretation of dissolved oxygen content
CO3	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science,

			engineering fundamentals for finding out chemical parameters like pH, acidity, alkalinity
	PO2	**3**	The students will be able to identify, formulate, review research literature, and analyze pH, acidity, alkalinity using Indian standard methods in reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
	PO3	**2**	The students will be able to design solutions for making the pH, acidity, alkalinity within the standard levels
CO4	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals for finding out the physical characteristics viz. colour, turbidity, and conductivity of a given water sample
	PO2	**3**	The students will be able to identify and examine physical characteristics viz. colour, turbidity, and conductivity of a given water sample using natural sciences, and engineering sciences
CO5	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to find the optimum dosage of alum using Jar test
	PO2	**3**	The students will be able to identify, formulate, review research literature, and analyze the optimum dosage of alum using Jar test reaching substantiated conclusions natural sciences, and engineering sciences
CO6	**PO1**	**3**	The students will be able to apply the knowledge of mathematics, science, engineering fundamentals to examine the chemical characteristics viz. chlorides, Iron, Available Chlorine and sulphates content to assess its suitability for drinking purposes.
	PO2	**3**	The students will be able to identify, formulate, review research literature, and analyze chemical characteristics viz. chlorides, Iron, Available Chlorine and sulphates content using first principles of mathematics, natural sciences, and engineering sciences

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will have knowledge about water quality standards
CO2	**PSO1**	**3**	Graduates will able to analyze the dissolved oxygen content in drinking water
CO3	**PSO1**	**3**	Graduate will be able to measure chemical characteristics of a given water sample viz. pH, acidity, alkalinity
CO4	**PSO1**	**3**	Graduates will have a knowledge to measure the physical characteristics viz. colour, turbidity, and conductivity of a given water sample
CO5	**PSO1**	**3**	Graduates will have a knowledge to estimate the optimum dosage of alum using Jar test
CO6	**PSO1**	**3**	Graduate will be able to Determine the chemical characteristics of a given water sample viz. chlorides, Iron, Available Chlorine and sulphates content to assess its suitability for drinking purposes

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF CIVIL ENGINEERING

SEMESTER 8

CE402 ENVIRONMENTAL ENGINEERING II

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Environmental Engineering II**	Course code**: CE402**
L-T-P**:** **3-0-0**	Credit**:** **3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Wastewater- Sources and flow rates, Domestic wastewater, Estimation of quantity of wastewater, Dry weather flow, storm water flow, Time of concentration Sewers, Design of circular sewers under full and partial flow conditions	6	15 %
II	Sewer appurtenances-Man holes, Catch basin, flushing devices, Inverted siphon. Ventilation of sewers. Sewage, Sewerage, Systems of sewerage Sewage characteristics- Physical, chemical and biological parameters, Biological oxygen demand, first stage BOD, Chemical oxygen demand, Relative stability, Population equivalent.	7	15 %
III	Waste water disposal systems- Self purification of streams, Dilution -Oxygen sag curve, Streeter Phelp's Equation, land treatment Treatment of sewage-Preliminary and Primary treatment -Theory and design of Screen, Grit chamber, Detritus chamber, Flow equalization tank and Sedimentation tank.	6	15 %
IV	Secondary treatment methods-Contact bed, Intermittent sand filter, Theory and design of Trickling filter, Activated sludge process, Trickling filter-High rate, standard. Rotating biological contactor	7	15 %
V	Design of septic tank and Imhoff tank Principle and working of oxidation ponds and oxidation ditch. Aerated lagoons, design of upflow anaerobic sludge blanket reactors	8	20 %

VI	Sludge treatment and disposal-Methods of thickening, Sludge digestion- Anaerobic digestion, Design of sludge digestion tanks and Sludge drying beds, methods of sludge disposal	8	20 %

TEXT BOOKS:

1	B.C Punmia , "Waste Water Engineering", Laxmi Publications Pvt. Ltd, 2012
2	Howard S Peavy, Donald R Rowe, George Tchobanoglous, Environmental Engineering, Mc Graw Hill Education, 1984
3	P N Modi, "Sewage Treatment & Disposal and Waste water Engineering", Standard Book House, NewDelhi, 2e, 2008.
4	S.K. Garg , "Sewage disposal and Air pollution Engineering", Khanna Publishers, 2008
5	G S Birdie, Water Supply and Engineering, Dhanpat Rai Publishing Company,

REFERENCES:

1	G. L. Karia, R.A. Christian, Wastewater treatment: Concepts And Design Approach, PHI learning Pvt Ltd, 2013
2	J. Arceivala, Shyam R. Asolekar, Wastewater Treatment for Pollution Control and Reuse, McGrawhill Education, 2007
3	K N Duggal, Elements of Environmental Engineering, S Chand Publications, 2007
4	Mackenzie L Davis, Introduction to Environmental Engineering, McGraw Hill Education (India), 5e, 2012
5	Metcalf and Eddy, "Waste Water Engineering", Tata McGraw Hill publishing Co Ltd, 2003

PREREQUISITE: CE405 Environmental Engineering I

COURSE OBJECTIVES

1	To understand the various sources and characteristics of wastewater
2	To know the various treatment methods available for wastewater treatment

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Estimate quantity of wastewater and to design sewer
2	Demonstrate sewer appurtenances, sewerage systems and sewage characteristics
3	Illustrate wastewater disposal systems and primary treatment of wastewater
4	Develop the principle and design of secondary treatment units.
5	Explain principle and working of different units such as oxidation ditch and oxidation ponds, lagoons, UASB, septic tank and imhoff tank
6	Summarize sludge treatment and disposal

CO-PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**2**	**2**													**3**	
CO2	**2**					**1**	**2**								**3**	
CO3	**2**	**1**				**2**	**3**							**2**	**2**	
CO4	**2**	**2**					**2**		**2**					**2**	**2**	
CO5	**2**	**2**					**2**		**2**					**2**	**2**	
CO6	**1**						**2**									

CO-PO MAPPING JUSTIFICATION

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Apply the knowledge of science for the estimation of quantity of sewage and storm water
	PO2	2	Identifying and analyzing problems of sewage flow
CO2	PO1	2	Apply the knowledge of environmental chemistry and hydraulics
	PO6	1	Apply reasoning information of wastewater characteristics with regard to society, health and safety

	PO7	2	As a powerful aid of sustainable development
CO3	PO1	2	Apply knowledge of science to arrive at different types of treatment methods that can be used at different situations
	PO2	1	Identify and analyze waste water problems in different areas to arrive at substantiated conclusions
	PO6	2	Apply reasoning information of disposal methods with regard to society, health and safety
	PO7	2	Understand the impact of different wastewater disposal methods on society and environment.
CO4	PO1	2	Apply knowledge of science to arrive at different types of treatment methods that can be used at different situations
	PO3	2	Designing waste water treatment units to meet the specifications with consideration for the public health and safety
	PO7	2	Sustainable solution for the wastewater mismanagement problem
	PO9	2	Multidisciplinary nature of the waste water problem with essential team work at times.
CO5	PO1	2	Apply knowledge of science to arrive at different types of treatment methods that can be used at different situations
	PO3	2	Designing waste water treatment units to meet the specifications with consideration for the public health and safety
	PO7	2	Sustainable solution for the wastewater mismanagement problem
	PO9	2	Multidisciplinary nature of the waste water problem with essential team work at times.
CO6	PO1	1	Apply knowledge of science to arrive at different types of sludge treatment methods
	PO7	2	Sludge treatment and disposal methods as sustainable solution for the wastewater mismanagement problem

CO-PSO MAPPING JUSTIFICATION

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO2	3	The graduates of the programme will have a broad understanding of environmental factors involved in waste water management

CO2	PSO2	3	The graduates of the programme will have a broad understanding of environmental factors involved in waste water management
CO3	PSO1	2	Graduates will be able to design primary wastewater treatment unitsl
	PSO2	2	Understanding of disposal system and processes in terms of environmental aspects beneficial for the society
CO4	PSO1	2	Graduates will be able to design aerobic units like activated sludge process, trickling filter etc
	PSO2	2	Understanding of disposal system and processes in terms of environmental aspects beneficial for the society
CO5	PSO1	2	Graduates will be able to design units like oxidation ditch, UASB, Imhoff tank etc.
	PSO2	2	Understanding of disposal system and processes in terms of environmental aspects beneficial for the society
CO6	PSO1	2	Graduates will be able to design sludge treatment units
	PSO2	2	Understanding of disposal system and processes in terms of environmental aspects beneficial for the society

CE404 CIVIL ENGINEERING PROJECT MANAGEMENT

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Civil engineering project management**	Course code**: CE 404**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Unique features of construction projects ; Identification of components –Principles of preparing DPR- Construction planning and scheduling - I – Bar charts, Network Techniques, Use of CPM and PERT for planning – Drawing network diagrams – time estimates – slack – critical path-Examples	7	15 %
II	Crashing and time –cost trade off, Resource smoothing and resources levelling - Construction, equipment, material and labour schedules. Preparation of job layout. Codification of the planning system : Codification approach- Work package and activities identification code – Resource codes – Cost and Finance accounting codes – Technical document codes.	7	15 %
III	Construction disputes and settlement : Types of disputes – Modes of settlement of disputes – Arbitration- Arbitrator - Advantages and disadvantages of arbitration – Arbitration Award. Construction cost and budget :Construction cost – Classification of construction cost – Unit rate costing of resources- Budget – Types of budget – Project Master budget.	6	15 %

IV	Concept of ethics – Professional ethics – ethical problems – provisions of a professional code – Role of professional bodies. Project management information system- Concept – Information system computerization –Acquiring a system – Problems in information system management -Benefits of computerized information system.	7	15 %
V	Concept of material management - inventory-inventory control- economic order quantity - ABC analysis. Safety in construction- safety measures in different stages of construction - implementation of safety programme	7	20 %
VI	Construction procedures: different methods of construction – types of contract – Tenders – prequalification procedure - earnest money deposit – contract document – General and important conditions of contract - measurement and measurement book - Inspection and quality control - need, principles and stages. Basics of Total Quality Management	8	20 %

TEXT BOOKS:

1	Kumar Neeraj Jha, Construction Project Management, Pearson, Dorling Kindersley (India) pvt. Lt
2	L.S. Srinath – PERT and CPM –Principles and Applications, Affiliated East-West Press, 2001
3	Peurifoy and Schexnayder – Construction Planning, Equipment, and Methods, Tata McGraw Hill, 2010

REFERENCES:

1	B.C.Punmia & K K Khandelwal, Project Planning with CPM and PERT, Laxmi Publication, New Delhi, 2016
2	Charles D Fledderman, Engineering Ethics, Prentice Hall, 2012

3	F. Harris, Modern Construction and Ground Engineering Equipment and Methods, Prentice Hall, 1994
4	Gahlot and Dhir, Construction Planning and Management, New Age International, 1992
5	K KChitkara, Construction Project Management, McGraw Hill Education Pvt Ltd., 2000
6	Khanna, O.P., Industrial Engineering and Management., Dhanapat Rai Publications, 1980
7	National Building Code, BIS
8	P.P. Dharwadkar, Management in Construction Industry, Oxford and IBH
9	Shrivastava, Construction Planning and Management, Galgotia Publications, 2000

PREREQUISITE: HS300 Principles of Management

COURSE OBJECTIVES

1	To impart knowledge on principles of planning and scheduling projects, with emphasis on construction.
2	To study the legal and ethical issues related to construction projects
3	To become familiar with TQM and similar concepts related to quality
4	To impart knowledge in the principles of safe construction practices
5	To understand the need of ethical considerations in construction

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Create Plan and schedule of a construction project
2	Identify various management techniques involved in construction project
3	Familiarise the legal procedures in construction contracts
4	Formulate suitable quality management plan for construction
5	Familiarise the safety practices and procedures.
6	Apply principles of ethics in decision making

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**													**3**		
CO2					**3**											**2**
CO3						**3**		**2**			**3**				**2**	
CO4							**3**								**2**	
CO5			**3**								**3**				**3**	
CO6						**2**		**3**							**3**	**3**

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of principle of planning and scheduling in construction project
CO2	PO5	3	Selection and application of various construction equipments by understanding the limitations
CO3	PO8	2	Application of ethical principle and professional ethics in engineering practice
	PO6	3	Applying the consequent knowledge on legal issues within a project
	PO11	3	Able to manage projects in multidisciplinary environments
CO4	PO7	3	Application of concepts related to quality like TQM for sustainable development
CO5	PO11	3	Demonstrate knowledge and understanding of engineering and management principle in safe construction practices
	PO3	3	Impart the knowledge of safe construction practices to meet the consideration of public and workers health and safety
CO6	PO8	3	Apply ethical principles and professional ethics in construction
	PO6	2	Apply ethical values to assess societal safety health legal and cultural issues

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	The graduates will be able to plan and schedule a consruction project
CO2	PSO3	2	The graduates will be able to find the suitability of modern tools

CO3	PSO2	2	The graduates will be able to understand the legal issues related to construction project and find a solution for the same
CO4	PSO2	2	The graduates will be able to provide quality outputs
CO5	PSO2	3	The graduates will be able to provide safer working environment in construction field
CO6	PSO3	3	The graduates will be able to work with ethical values within multidisciplinary teams
	PS02	3	The graduates will be able to safeguard ethical values in their field

CE464 REINFORCED SOIL STRUCTURES AND GEOSYNTHETICS

Program: **Civil engineering**	Degree : **B-Tech**
Course**:** **Reinforced soil structures and geosynthetics**	Course code**: CE 464**
L-T-P**:** **3-0-0**	Credit**:** **3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction -history –ancient and modern structures- Types of geosynthetics, advantages, disadvantages. Functions of geosynthetics and application areas where these functions are utilized such as in retaining walls, slopes, embankments, railway tracks, pavements etc. (general overview)	5	15 %
II	Raw materials used for geosynthetics, manufacturing process of woven and non woven geotextiles, geomembranes, geogrids. Properties of geosynthetics. Creep and long term performance. Reinforced soil - Advantages and disadvantages. Fills, Types of facings, Factors affecting the performance of reinforced soil.	7	15 %
III	Mechanism of reinforcement action - Equivalent Confining Stress Concept, Pseudo Cohesion Concept, Concept of Expanding soil mass. – Simple problems.	7	15 %
IV	Design and analysis of vertically faced reinforced soil retaining walls- External stability and Internal stability – Tie back wedge analysis and coherent gravity analysis. Assumptions, limitations and numerical problems. Construction methods of reinforced retaining walls. Geosynthetics in pavements, function and benefits.	7	15 %

V	Bearing capacity improvement using soil reinforcement – Binquet and Lee's analysis – Assumptions, failure mechanisms. Simple problems in bearing capacity. Geosynthetics for short term stability of embankments on soft soils. Natural geotextiles, Advantages and disadvantages, functions, erosion control- types of erosion control products, installation methods.	9	20 %
VI	Prefabricated vertical drains along with design principles and installation method Concept of Geocells, Gabion Walls, encased stone columns, geocomposites, soil nailing, geotubes, geobags (only basic concepts), application in landfills.	7	20 %

TEXT BOOKS/ REFERENCES:

1	Jones, C.J.F.P. (1985). Earth reinforcement and soil structures. Butterworth, London.
2	Koerner, R.M. (1999). Designing with Geosynthetics, Prentice Hall, New Jersey, USA, 4th edition
3	Rao, G.V. (2007). Geosynthetics – An Introduction. Sai Master Geoenvironmental Services Pvt. Ltd., Hyderabad
4	Rao, G.V., Kumar, S. J. and Raju, G.V.S.S. (Eds.). Earth Reinforcement – Design and Construction. Publication No. 314, Central Board of Irrigation and Power, New Delhi, 2012
5	Sivakumar Babu, G.L. (2006). An introduction to Soil reinforcement and geosynthetics. United Press (India) Pvt. Ltd.

PREREQUISITE: CE 305 Geotechnical Engineering II

COURSE OBJECTIVES

1	To understand the history and mechanism of reinforced soil
2	To know the various types of geosynthetics, their functions and applications.
3	To enable the design of reinforced soil retaining structures

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Describe the history of reinforced soil and generate a brief idea about geosynthetics
2	Distinguish different types of Geosynthetics and its manufacturing
3	Explain the mechanism of reinforcement action
4	Design and analyse reinforced soil retaining walls
5	Analyse bearing capacity improvement using soil reinforcement and describe about natural geosynthetics
6	Compare different forms of geosynthetics and its applications

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO1	**3**	**3**												**3**		
CO2	**3**		**3**			**2**	**2**							**3**		
CO3	**3**					**2**	**2**							**3**		
CO4		**3**												**3**		
CO5		**3**												**3**		
CO6	**2**													**3**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Basics of reinforced soil mechanism is essential to understand scope and use of geosynthetics
CO1	PO2	3	A thorough knowledge about reinforced soil mechanism is essential to to design vertically faced reinforced soil retaining walls

CO1	PO3	3	Analysis of retaining walls embedded with reinforcement requires basic concepts of reinforced soil mechanisms
CO2	PO6	2	Conceptualize alternative solutions to several field problems based on the use of geosynthetics
CO2	PO1	3	Knowledge about the historical development of geosynthetics is essential to understand its applications in various fields such as retaining walls, slopes, embankments, railway tracks, pavements
CO2	PO3	3	Design of geotextiles embedded retaining walls
CO2	PO7	2	Compare different products and select appropriate geosynthetic products for different applications by considering environmental sustainability
CO3	PO1	3	Basic knowledge regarding historical development of soil reinforcement is useful to understand different types of geosynthetics and their functions
CO3	PO6	2	Application of geosynthetics to solve the problems regarding separation and filtration function in pavement layer, surface erosion protection etc.
CO3	PO7	2	Environmental friendly natural geosynthetics such as coir, jute, and hemp can be used for sustainable development of society
CO4	PO2	3	Apply simple design methods to filtration, reinforced soil walls and slopes, reinforced pavements, basal reinforcement of embankments, reinforced soil walls and slopes.
CO5	PO2	3	Analysis of bearing capacity improvements using different methods
CO 6	PO1	2	Knowledge about different forms of geosynthetivs

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	**3**	Graduates will have knowledge in history and functions of geosynthetics
CO2	PSO1	**3**	Graduates will apply the knowledge of geosynthetics in practical cases

CO3	PSO1	**3**	Graduates will have a knowledge about types of geosynthetics and their functions
CO4	PSO1	**3**	Graduates will be able to do simple design of reinforced soil retaining walls and reinforced earth beds
CO5	PSO1	**3**	Graduates will have a knowledge in analysis of bearing capacity improvements using geosynthetics
CO6	PSO1	**3**	Graduates will have a knowledge about different forms of geosynthetics and its area of applications

CE474 TRANSPORTATION PLANNING

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Transportation Planning**	Course code**: CE 474**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction: Role of transportation in the development of a society- Land use-Transportation interaction - Goal, objectives and constraints in transportation planning process – Transportation Systems overview - Transportation issues and challenges – Basic steps in systems planning process	6	15 %
II	Different modes of transport - Characteristics of different modes - integration of modes and interactions - impact on environment - Relationship between Movement and Accessibility – Hierarchy of transportation facilities - Brief Study of Urban Travel Patterns and Urban Transportation Technologies - Comprehensive Mobility Plan	7	15 %
III	Urban Transportation Planning:Urban Activity System - Trip-based and Activity-based approaches - inventory, model building, forecasting and evaluation stages –Definition of study area – zoning - Urban Structure and its Characteristics	6	15 %
IV	Four Step Planning process – Trip generation – trip production and trip attraction models – regression and category analysis - Trip Distribution-Growth factor models, Gravity models - mode split models	8	15 %
V	Route choice modeling - diversion curves - basic elements of	8	20 %

	transportation networks, coding, minimum path trees - traffic assignment - all- or- nothing assignments, capacity restraint techniques		
VI	Land use transport models - Lowry derivative models - Quick response techniques - Non-Transport solutions for transport problems.	7	20 %

TEXT BOOKS:

1	Bruton, M. J., Introduction to Transportation Planning, Hutchinson of London
2	Dickey, J. W. Metropolitan Transportation Planning, Tata McGraw Hill
3	Papacostas, C. S. and Prevedouros, P.D., Transportation Engineering and Planning, Prentice Hall**.**

REFERENCES:

1	A V Narasimha Rao and C Venkatramaiah, Numerical Problems, Examples and Objective questions in Geotechnical Engineering, Universities Press (India) Ltd., 2000
2	Arora K. R., Geotechnical Engineering, Standard Publishers, 2006.
3	Purushothamaraj P., Soil Mechanics and Foundation Engineering, Dorling Kindersley(India) Pvt. Ltd., 2013
4	Taylor D.W., Fundamentals of Soil Mechanics, Asia Publishing House, 1948.
5	Terzaghi K. and R. B. Peck, Soil Mechanics in Engineering Practice, John Wiley, 1967.
6	Venkatramaiah, Geotechnical Engg, Universities Press, 2000.

PREREQUISITE: nil

COURSE OBJECTIVES

1	To expose the students to the dynamics of urban travel patterns
2	Familiarize with land use and transport interaction
3	To know the various steps and techniques involved in transportation planning process

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Generalize the transportation planning process
2	Compare various modes and its characteristics
3	Discuss urban transportation planning process.
4	Determine the four step planning process in transportation planning.
5	Describe about the route choice modeling.
6	Compare land use transport model.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	2												2	
CO2						2								3		
CO3							2								3	
CO4	3	3												1		
CO5	3	2												2		
CO6		2													2	

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of transportation planning to the solution of complex transportation problems
	PO2	3	Analyze the problems arrive at transportation
	PO3	2	Design solutions for transportation problems.
CO2	PO6	2	Apply the contextual knowledge to assess societal, health and safety.
CO3	PO7	2	Understand the relationship of various urban transportation planning process.
CO4	PO1	3	Apply the knowledge of mathematics in four step planning process for transportation planning.
	PO2	3	Able to analysis the transportation planning by four step planning process.
CO5	PO1	3	Apply the knowledge of mathematics in route choice modelling for transportation planning

	PO2	2	By applying the first principle of mathematics the route choice modelling can be done.
CO6	PO2	2	Understand the relationship of land-use and transport model to get solutions in societal and environmental contexts.

CO-PO MAPPING JUSTIFICATION:

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO2	2	The graduates of the program me are able understand the societal and safety factors involved in the calibration of planning process
CO2	PSO2	3	Graduates will able to understand the environmental, societal and safety factors involved during various planning methods..
CO3	PSO2	3	Graduates will have broad understanding of environmental, societal and safe factors involved in the development of urban transportation planning

CO4	PSO1	1	The graduates of the program me are able to analyze and design transportation planning by four step planning process.
CO5	PSO1	2	The graduates of the program me are able understand the societal and safety factors involved in the route choice modeling process.
CO6	PSO2	2	The graduates of the program me are able understand the societal and safety factors involved in the land use and transportation.

CE482 ENVIRONMENTAL IMPACT ASSESSMENT

Program: **Civil engineering**	Degree : **B-Tech**
Course**: Environmental Impact Assessment**	Course code**: CE482**
L-T-P**: 3-0-0**	Credit**: 3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY MARKS
I	Introduction: Classification of Pollution and Pollutants, AIR pollution: Primary and Secondary Pollutants, air pollutants-sulfur dioxidenitrogen dioxide, carbon	7	15 %

	monoxide, Impact of air pollutants on human, vegetation and environment, , Ambient Air Quality Standards		
II	Water pollution: Point and Non-point Source of Pollution, Major Pollutants of Water, Physical, chemical and biological characteristics of water , Water borne diseases, Water Quality standards	7	15 %
III	Solid waste: Classification and sources of Solid Waste, Characteristics of Solid Waste, e waste, Radioactive wastes land/soil pollution: Effects of urbanization on land degradation, Impact of Modern Agriculture on Soil, pesticide pollution, Effect on Environment	6	15 %
IV	Noise pollution: Sources of Noise, Effects of Noise, measurement of noise, Equivalent sound pressure level, Control measures	6	15 %
V	Impacts of pollutants, types, scale of impactGlobal, local pollutants. Climate change, Ozone layer depletion, Deforestation, land degradation Environmental impact assessment, Need for EIA,	8	20 %
VI	EIA Procedure-Screening, Scoping, EIA procedure in India, Impact analysis- checklists, matrix methods, overlay analysis, Case studies of EIA	8	20 %

TEXT BOOKS / REFERENCES

1	Peavy H S, Rowe, D.R. Tchobanaglous “Environmental Engineering” Mc GrawHill Education
2	Mackenzie L Davis, Introduction to Environmental Engineering, McGrawhill Education (India)
3	Larry W Canter, “Environmental Impact Assessment”,Mc Graw Hill Inc. , Newyork.
4	B.C Punmia , “Waste Water Engineering”, Laxmi Publications Pvt. Ltd,
5	Dr. PN Modi, “Sewage Treatment & Disposal and Waste water Engineering”, Standard Book House, NewDelhi
6	Rau G J and Wooten C.D “EIA Analysis Hand Book” Mc GrawHill
7	Robert A Corbett “Standard Handbook of Environmental Engineering” McGrawHill

8	John Glasson, Riki Therivel & S Andrew Chadwick "Introduction to EIA" University College London Press Limited

PREREQUISITE: nil

COURSE OBJECTIVES

1	To study various types of environmental pollution
2	To study the impact of various types of pollutants & their assessment techniques

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Describe air pollution sources and their impacts
2	Recall Water pollution sources and their impacts, various water born diseases
3	State solid wastes sourses, impacts and land soil pollution
4	Outline noise pollution , sources and effects
5	Label Impacts of pollutants
6	Explain EIA , procedure and analysis

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1						3	3							1	2	
CO2						3	3							1	2	
CO3						2	2							1	3	
CO4						2								1	2	
CO5						2								1	2	
CO6								2							1	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO6	3	Able to understand various types of air pollution and sources
	PO7	3	Impacts of air pollution and their solution by professional engineering
CO2	PO6	2	Able to understand origin of water pollution

	PO7	3	Impacts of water pollution and their solution by professional engineering
CO3	PO6	2	Brief knowledge impacts of land soil pollution
	PO7	3	Impacts of land soil pollution and their solution by professional engineering
CO4	PO6	2	Brief knowledge about societal , health ,and cultural issues of noise pollution
CO5	PO6	2	Brief knowledge impacts of pollutants
CO6	PO8	2	Ethical principles and EIA procedure and analysis

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**1**	The graduates of the program are able to understand various types of air pollution
	PSO2	**2**	The graduates of the program are able to understand environmental factors and various types of air pollution
CO2	**PSO1**	**1**	The graduates of the program are able to understand various sources of water pollution
	PSO2	**2**	The graduates of the program are able to understand environmental factors and sources of water pollution
CO3	**PSO1**	**1**	The graduates of the program obtain a brief knowledge about impacts of land soil pollution.
	PSO2	**3**	The graduates of the program are able to understand environmental, societal, safety factors of land soil pollution
CO4	**PSO1**	**1**	The graduates of the program obtain a brief knowledge about impacts of noise pollution.
	PSO2	**2**	The graduates of the program are able to understand societal and safety factors of Noise pollution
CO5	**PSO1**	**1**	The graduates of the program obtain a brief knowledge about impacts of pollutants
	PSO2	**2**	The graduates of the program are able to understand environmental, societal, safety factors of various pollutants
CO6	**PSO2**	**1**	The graduates of the program will have an idea about EIA procedure

CE492 PROJECT

COURSE INFORMATION SHEET:

Program: **Civil engineering**	Degree : **B-Tech**
Course**:**	Course code**:**
L-T-P**:**	Credit**:**

PREREQUISITE: nil

COURSE OBJECTIVES

1	To apply engineering knowledge in practical problem solving
2	To foster innovation in design of products, processes or systems
3	To develop creative thinking in finding viable solutions to engineering problems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Contrast innovations on the development of components, products, processes or technologies in the engineering field.
2	Apply knowledge in solving real life engineering problems

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	-	-	3	3	3	-	1	-	2	-	-	-		3	1	3
CO2	-	3	3	1	2	-	-	-	1	-	-	-		3	1	3

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO3**	**3**	Design solutions for different engineering problems and design system components to meet the specifications with consideration.
	PO4	**3**	Research-based knowledge including design, analysis and interpretation of data to provide valid conclusions.
	PO5	**3**	Apply appropriate techniques, resources, and modern engineering softwares and IT tools for analyzing, modeling and designing to complex engineering activities with an understanding of the limitations.
	PO7	**1**	Analyse the impact of the professional engineering solutions in societal and environmental contexts.
	PO9	**2**	Perform effectively as an individual, and as a team member.

CO2	PO2	3	Analyze engineering problems and arrive at substantiated conclusions using mathematical, natural, and engineering sciences and through experiments.
	PO3	2	Design solutions for engineering problems by analyzing it through different methods.
	PO4	3	Research-based knowledge including analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	2	Apply modern engineering IT tools to complex engineering activities with an understanding of the limitations.
	PO9	2	Perform effectively as an individual, and as a team member.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates shall demonstrate knowledge in modelling, analysis, design, laboratory investigations of civil engineering infrastructures.
	PSO2	3	Graduates will have a broad knowledge to evaluate economical and safety factors involved in infrastructural development.
	PSO3	3	Graduates can perform effectively as a team member and leader and using modern tools and techniques.
CO2	PSO1	3	Graduates acquire knowledge in analysis, design, laboratory investigations on civil engineering infrastructure.
	PSO2	3	Graduates will have a broad knowledge to evaluate economical and safety factors involved in infrastructural development.
	PSO3	3	Graduates can perform effectively as a team member and leader and using modern tools and techniques.