



SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
Accredited by NAAC with 'A' Grade, All UG Programmes are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

CIVIL ENGINEERING (Accredited by NBA)

SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

II/IV B.TECH

I-SEMESTER

(With effect from 2019-2020 Admitted Batch onwards)

Subject Code	Name of the Subject	Category	Cr	L	T	P	Internal Marks	External Marks	Total Marks
B19 BS 2102	Mathematics-IV	BS	3	3	--	--	25	75	100
B19 CE 2101	Mechanics of Solids	PC	3	3	--	--	25	75	100
B19 CE 2102	Fluid Mechanics	PC	3	3	--	--	25	75	100
B19 CE 2103	Building Materials, construction and Planning	PC	3	3	--	--	25	75	100
B19 CE 2104	Surveying	PC	3	3	--	--	25	75	100
B19 CE 2105	Environmental Engineering-I	PC	3	3	--	--	25	75	100
B19 CE 2106	Surveying Field Work	PC	1.5	--	--	3	20	30	50
B19 CE 2107	Strength of Materials Lab	PC	1.5	--	--	3	20	30	50
B19 MC 2103	Constitution of India	MC	0	3	--	--	--	--	--
TOTAL			21	21	--	6	190	510	700

Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS2102	BS	3	--	--	3	25	75	3 Hrs.
MATHEMATICS IV								
(Complex Variables & Statistical Methods)								
(Common to CE & EEE)								
Pre-requisites: Basic concepts of Probability theory and Baye's Theorem								
Course Objectives:								
1.	Learn the concept of Analytic function and its implications. Applications in Electrostatics and fluid flow problems.							
2.	Learn the concepts in complex integration and evaluation of real definite integrals.							
3.	Formulate and solve linear difference equations.							
4.	Learn important concepts of Z-transform and their use to solve linear difference equations.							
5.	Know the concepts of discrete and continuous random variables, learn a few important discrete / continuous probability distributions							
6.	Learn Concepts of Sampling theory and develop a framework for testing of hypothesis for getting inferences about Population Parameters.							
Course Outcomes:								
S.No	Outcome							Knowledge Level
1.	Comprehend the concept of Analytic function and apply in Electrostatics and Fluid dynamics							K2
2.	Determine Laurent series of functions about isolated singularities, and determine residues. Use the residue theorem to evaluate certain real definite integrals.							K3
3.	Formulate and solve linear difference equations.							K2
4.	Use Z-transforms to solve linear difference equations with constant coefficients.							K3
5.	Identify a random variable as discrete/continuous, find its expected value and also fit a probability distribution for a given frequency distribution.							K3
6.	Decide the test applicable and apply it for giving inference about Population Parameter based on sample statistic for some large samples and small samples.							K3
SYLLABUS								
UNIT-I (12 Hrs)	Functions of a Complex Variable Review- Cartesian form and polar form of a complex variable, Real and imaginary parts of z^n , e^z , $\sin z$, $\sinh z$ and $\log z$ (no questions may be set on the review portion). Limit and continuity of a function of a complex variable, derivative, analytic function, entire function, Cauchy- Riemann equations, determine an analytic function based on the knowledge of its real and imaginary parts, Milne-Thomson method, Applications of analytic function to flow problems, and in Electrostatics. Conformal mapping: the transformations defined by $w = z+c$, $w = cz$, $w = 1/z$. The Bilinear transformation.							
UNIT-II (10 Hrs)	Complex Integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula. Expansion of a function in a Taylor series, McLaren series and Laurent series. Types of singularities, Residues, Cauchy's residue theorem. Evaluation of real definite integrals -integration around unit circle (Theorems without proofs).							

UNIT-III (14 Hrs)	Difference equations and Z-transforms : Formation of a difference equation, Rules for finding complimentary function and particular integral for linear difference equations. Definition of Z- transform, some standard Z- transforms, properties, transform of a function multiplied by n, initial value theorem and final value theorem(without proof), evaluation of inverse Z- transforms, convolution theorem (without proof), solution of linear difference equations by the use of Z- transforms.
UNIT-IV (10 Hrs)	Probability Distributions : A brief review of random variables, Binomial, Poisson and Normal distributions, definitions of pmf/ pdf, notation, mean, variance, moment generating function. Fitting of Binomial or Poisson distributions for a given frequency distribution.
UNIT-V (12 Hrs)	Sampling theory and Testing of Hypothesis : Sampling theory: Introduction, population and samples, Sampling distribution, standard error, central limit theorem (without proof), level of significance, procedure of testing of hypothesis. Large samples: Testing of hypothesis for single proportion and two proportions. Small samples: Degrees of freedom, Students' t- distribution, t-test for single mean, two means; Chi- squared distribution, test for goodness of a fit.
Text Books:	
1.	Scope and Treatment as in “Higher Engineering Mathematics”, by Dr.B.S.Grewal, 43 rd Edition, Khanna Publishers.
2.	Probability and statistics for Engineers, Miller and Freund, 7 th edition, Pearson 2008.
Reference Books:	
1.	Fundamentals of Mathematical Statistics by S.C.Gupta and V.K.Kapoor, Sultan Chand & Sons Publishers
2.	Probability and statistics for Engineers and Scientists by Ronald E. Walpole, Sharon L. Myers and Keying Ye, Eighth edition, 8 th edition, Pearson Education, 2007.
3.	Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley
4.	Higher Engineering Mathematics, by B.V.Ramana, Tata Mc Graw Hill Company.
5.	A text book of Engineering Mathematics, by N.P.Bali and Dr. Manish Goyal, Lakshmi Publications.
6.	Advanced Engineering Mathematics, by H.K.Dass, S.ChandCompany.
7.	Higher Engineering Mathematics, by Dr. M.K.Venkatraman, the National Publishing Company

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2101	PC	3	--	--	3	25	75	3 Hrs.

MECHANICS OF SOLIDS

Course Objectives:

1. To introduce the concepts of stress, strain and elastic constants and their relations.
2. To familiarize with shear force, bending moment, deflections and torsion induced, shear stresses and bending stresses developed for different sections of beams and shafts
3. To impart the knowledge on the concept of principal stresses and principal strains
4. To familiarize with stresses and strains induced in columns & cylinders

Course Outcomes: Upon successful completion of the course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Summarize the behavior of basic materials under the influence of different external loading conditions and support conditions and also to determine the principal stresses & strains under different loadings.	K3
2.	Determine shear Force and Bending moments in statically determinate Beams and draw the Diagrams.	K3
3.	Calculate the bending stresses, shear stresses, torsional stresses in structural members and also stiffness of springs.	K3
4.	Examine the basic methods to find slope and deflection of beams subjected to loads.	K3
5.	Determine the crippling load for columns with different end conditions and calculate the stresses in Thin & Thick cylinders	K3

SYLLABUS

UNIT-I (12 Hrs)	<p>Definitions of stress and strain – types of stresses and strains – Elasticity – Hooke’s law – Stress – Strain diagram for Mild steel – working stress- factor of safety- Lateral strain – Poisson’s ratio and volumetric strain – Elastic Moduli and the relationship between them – Bars of varying section – composite bars – temperature stresses.</p> <p>Strain Energy: Definition – Resilience – SE due to gradually applied; suddenly applied and impact loads – simple applications</p> <p>Principal Stresses and Strains: Introduction-stresses on an inclined section of a bar under axial loading- compound stresses-Normal and tangential stresses on an inclined plane for biaxial stresses-Two perpendicular normal stresses accompanied by a state of simple shear-Mohr’s circle of stress-Principal planes and principal stresses- Construction of Mohr’s Circle (graphical Method)</p>
UNIT-II (8 Hrs)	<p>Shear Force & Bending Moment Diagrams: Definition of beam – Types of beams – concept of SF and BM – SF & BM diagrams for cantilever, SS and overhanging beams subjected point loads, UDL, Uniformly varying loads and combination of these loads – point of contraflexure – Relationship b/w S.F, BM and rate of loading.</p>

UNIT-III (10 Hrs)	Flexural Stresses & Shear Stresses: <i>Flexural Stresses:</i> Theory of simple Bending – Assumptions–Derivation of Bending equation - ($\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$) Neutral axis – Determination of bending stresses – section modulus of rectangular & Circular sections (Solid and Hollow), I, T, channel sections – Design of simple beam sections. <i>Shear Stresses:</i> Derivation of shear stress formula – shear stress distribution across various beam sections like rectangular, circular, Triangular, I, T, angle sections, built up beams, Definition of shear centre. Torsion of Circular Shafts: Theory of pure Torsion – Derivation of Torsion equation ($\frac{T}{J} = \frac{\tau_{max}}{R} = \frac{G\theta}{l}$) – Torsional moment of Resistance – polar section Modulus – power transmitted by a shaft – combined bending and torsion. Springs: Types of springs – springs in series and parallel – close coiled helical springs
UNIT-IV (10 Hrs)	Deflections of Beams: (i) Cantilever (ii) Simply supported and (iii) Over hanging beams using (a) Double integration and (b) Macaulay’s method
UNIT-V (10 Hrs)	Columns & Struts: Introduction – short, medium and long columns – axially loaded compression members – crushing load–Buckling load (or) critical load (or) crippling load – Euler’s theory for long columns – Assumptions – Derivations of Euler’s critical load formula for various end conditions – Effective length of column – slenderness ratio – limitations of Euler’s Theory – Rankine formula – for both long and short columns – column subjected to Eccentric loading – Euler’s Method and prof. Perry’s formula. Thin & Thick cylinders: Calculation of longitudinal and hoop stresses in thin cylinders subjected to internal pressure, Wire wound thin cylinders. Thick cylinders-Lame’s theory, Compound tubes
Text Books:	
1.	S.Ramamrutham ,Strength of materials, Dhanpat rai publishers
2.	Vazrani and Ratwani ,Strength of materials, Khanna Publishers
3.	T.D.Gunneswara Rao and Andal Mudimby,Strength of Materials Fundamentals and Applications, Cambridge University Press
Reference Books:	
1.	Timoshenko and Young, Elements of strength of materials, East West press private Ltd
2.	Popov, Introduction to mechanics of solids , Englewood cliffs N.J Prentice Hall
3.	Dr. R.K.Bansal, Strength of materials , Laxmi Publications

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2102	PC	3	--	--	3	25	75	3 Hrs.
FLUID MECHANICS								
Course Objectives:								
1.	To develop an insight into engineering problems related to fluids							
2.	learn about the pressure at a point, forces on fluid element and solve complex problems in engineering							
3.	know different types of fluid flows and apply the principles of conservations of mass, momentum and energy							
4.	know the Discharge, energy losses and water hammer in flow through pipes							
5.	Apply conservation principles of mass, momentum and energy on fluids using control volume approaches							
Course Outcomes:								
S.No	Outcome							Knowledge Level
1.	Determine the physical properties of fluids and different types of forces acting on a fluid element extended to forces on various gates.							K3
2.	Determine the forces that are acting on immersed bodies in static fluids through application of buoyancy and floatation							K3
3.	Determine velocity of fluid flows ,local and convective accelerations in 1D, 2D flows fields and derive the Laplace equation.							K3
4.	Apply conservation principles of mass, momentum and energy on fluids using control volume approaches.							K3
5.	Calculate the force exerted by the fluid on bends, nozzles using impulse momentum principle							K3
6.	Determine the shear stress, Velocity, loss of head in Laminar flow through circular pipes and Turbulent flow for rough and smooth pipes							K3
7.	Analyze the steady laminar and turbulent flows in pipes and solve the pipe networks problems							K4
SYLLABUS								
UNIT-I (10 Hrs)	Basic Fluid Properties: Definition of Fluid, basic properties of fluid, Viscosity - Newton's Law of Viscosity, Capillarity and Surface Tension. Fluid Pressure: Fluid Pressure at a point, Pascal's law, Variation of pressure with elevation, Hydrostatic law, Absolute, Gauge and Vacuum Pressures. Pressure measurement – Piezometers, Manometers and Pressure Gauges. Centre of Pressure, Forces on submerged surfaces, crest gates and lock gates.							
UNIT-II (10 Hrs)	Buoyancy and Floatation: Archimedes Principle- Buoyancy & Floatation - Stability of Floating Bodies- Centre of Buoyancy – Meta centric Height and its Determination. Fluid Kinematics: Types of fluid flow, Velocity, Rate of flow, Continuity Equation, Streamline, Path line, Streak line, Local, Convective and Total Acceleration; One & Two Dimensional Flows. Stream Function, Velocity Potential- Rotational & Irrotational Flows, Laplace Equation, Flow net.							

UNIT-III (10 Hrs)	<p>Fluid Dynamics: Energy possessed by fluid in motion, Euler's equation of motion - Bernoulli's equation. Energy correction factor. Venturimeter, orifice meter and nozzle meter.</p> <p>Flow through orifices and mouth pieces: Types of orifices and mouth pieces, coefficient of contraction, velocity and discharge.</p> <p>Flow through notches and weirs: Types of notches and weirs, Measurement of discharge</p>
UNIT-IV (10 Hrs)	<p>Impulse momentum equation – Momentum correction factor, Forces on pipe bends and reducers. Angular Momentum – Torque and work done; Sprinkler Problems.</p> <p>Laminar Flow: Relation between shear and Pressure Gradients in Laminar Flow; Reynold's experiment; Critical velocity; Steady laminar flow through a circular pipe – Hagen Poiseuille's Law. Turbulent flow: shear stress in Turbulent flow, prandtl mixing length theory, Velocity distribution in pipes, Hydro-dynamically smooth and rough boundaries, Velocity distribution in rough and smooth pipes, Resistance of smooth and rough pipes.</p>
UNIT-V (8 Hrs)	<p>Flow through pipes: Flow measurement through pipes –head due to friction – Darcy – Weisbach equation, minor losses, Total Energy Line, Hydraulic Gradient Line. Pipes in Series, pipes in parallel. Problems on Two reservoir and three reservoir flows. Water hammer, surge tanks.</p>
Text Books:	
1.	Fluid Mechanics and Hydraulic Machinery by P.N. Modi & S.M. Seth, Standard Book House
2.	Fluid Mechanics by A.K. Jain, Khanna Publishers.
3.	Fluid Mechanics by V.L.Streeter, TATA McGraw Hill
Reference Books:	
1.	Engineering Fluid Mechanics by K.L. Kumar, S. Chand & Co.
2.	Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications.
3.	F M White, Fluid Mechanics, Tata McGraw Hill Publication 2011
4.	Relevant NPTEL Courses.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2103	PC	3	--	--	3	25	75	3 Hrs.
BUILDING MATERIALS CONSTRUCTION AND PLANNING								
Course Objectives:								
1.	Initiating the student with the knowledge of basic building materials and their properties							
2.	Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped and flat roofs.							
3.	The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes							
4.	Imparting the students with the techniques of formwork and scaffolding							
5.	The students should be exposed to classification of aggregates, moisture content of the aggregate.							
Course Outcomes:								
S.No	Outcome							Knowledge Level
1.	Identify different building materials and their importance in building construction							K2
2.	Differentiate brick masonry, stone masonry construction and use of lime and cement in various constructions							K2
3.	Learnt the importance of building components and finishings							K2
4.	Draw developed plan, elevation, section, site plan for residential and public buildings							K3
5.	know the classification of aggregates, sieve analysis and moisture content usually required in building construction							K2
SYLLABUS								
UNIT-I (8 Hrs)	Stones, Bricks and Tiles: Properties of building stones – relation to their structural requirements, classification of stones – stone quarrying – precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials							
UNIT-II (8 Hrs)	Masonry: Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls. Wood: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel and Aluminium							
UNIT-III (10 Hrs)	Lime and Cement: Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime. Cement: Portland cement- Chemical Composition – Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance – various tests for concrete.							
UNIT-IV (12 Hrs)	Building Components: Lintels, arches, vaults, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs. Planning of Residential and Public buildings, specifications with line diagram							

UNIT-V (10 Hrs)	Finishings and Aggregates: Damp Proofing and water proofing materials and uses – Plastering Pointing, white washing and distempering. Paints: Constituents of a paint – Types of paints – Painting of new/old wood- Varnish. Form Works and Scaffoldings. Aggregates - Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis.
Text Books:	
1.	Building Materials, B. C. Punmia, Laxmi Publications private ltd
2.	Building Construction, B.C. Punmia, Laxmi Publications (p) ltd
3.	N.Kumaraswamy, A.Kameswara Rao, building planning and drawing, 7th Ed, Charotar Publishing House, 2019
4.	Building Materials, S. S. Bhavikatti, Vices publications House private ltd
5.	Building Construction, S. S. Bhavikatti, Vices publications House private ltd
Reference Books:	
1.	Building Materials, S. K. Duggal, New Age International Publications
2.	Building Materials, P. C. Verghese, PHI learning (P) ltd.
3.	Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi
4.	Building construction, P. C. Verghese, PHI Learning (P) Ltd.
5.	Building Materials, Construction and Planning, S.Mahaboob Basha, Anuradha Publications, Chennai.
6.	Building Byelaws by State and Central Governments and Municipal Corporations
7.	http://nptel.ac.in/courses/105102088/
8.	http://www.nptelvideos.in/2012/11/building-materials-and-construction.html

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2104	PC	3	--	--	3	25	75	3 Hrs.
SURVEYING								
Course Objectives:								
1.	Know the principle and methods of surveying							
2.	Measure horizontal and vertical- distances and angles							
3.	Perform calculations based on the observation.							
4.	Identification of source of errors and rectification methods							
5.	Apply surveying principles to determine areas and volumes and setting out curves							
6.	Use modern surveying equipment's for accurate results							
Course Outcomes:								
S.No	Outcome							Knowledge Level
1.	Apply the knowledge to calculate angles, distances and levels							K3
2.	Identify data collection methods and prepare field notes							K3
3.	Understand the working principles of survey instruments, measurement errors and corrective							K2
4.	Measures Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies							K3
SYLLABUS								
UNIT-I (10 Hrs)	<p>Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, surveying accessories. Introduction to Compass, leveling and Plane table surveying</p> <p>Measurement of Distances and Directions Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections</p> <p>Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip – W.C.B systems and Q.B. system of locating bearings (simple problems only)</p>							
UNIT-II (10 Hrs)	<p>Leveling- Types of levels, temporary and permanent adjustments, methods of leveling, booking and Determination of levels, Effect of Curvature of Earth and Refraction</p> <p>Contouring- Characteristics and uses of Contours, methods of contour surveying.</p> <p>Areas - Determination of areas consisting of irregular boundary and regular boundary.</p> <p>Volumes -Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits</p>							
UNIT-III (10 Hrs)	<p>Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrically leveling when base is accessible and inaccessible.</p> <p>Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements. (simple problems only)</p>							
UNIT-IV (8 Hrs)	<p>Tachometric Surveying: Principles of Tachometry, stadia and tangential methods of Tachometry</p> <p>Curves: Types of curves and their necessity, elements of simple, compound, reverse curves</p>							

UNIT-V (12 Hrs)	Modern Surveying Methods: Total Station and Global Positioning System. : Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS, Photogrammetric surveying applications and the limitations
Text Books:	
1.	Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
2.	Chandra A M, “Plane Surveying and Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi
3.	Duggal S K, “Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi
Reference Books:	
1.	Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill
2.	Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3.	Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2105	PC	3	--	--	3	25	75	3 Hrs.

ENVIRONMENTAL ENGINEERING-I

Course Objectives:

1.	Outline planning and the design of water supply systems for a community /town/city
2.	Provide knowledge of water quantity requirements and methods of piping
3.	Impart understanding of importance of protection of water source quality and methods of treatment of converting raw water into product water of required quality
4.	Design of water treatment plant for a village/city
5.	Impart knowledge on design of water distribution network

Course Outcomes: Upon successful completion of the course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Apply the concepts of population forecasting studies to determine the water demand	K3
2.	Explain the concepts of intake structures and pipes in water supply	K2
3.	Explain the quality of water with its physical, chemical and biological characteristics	K2
4.	Determine the sizes of different unit operations in a water treatment plant using the treatment principles	K5
5.	Utilize the concepts of distribution systems for building a better distribution network	K3

SYLLABUS

UNIT-I (10 Hrs)	<p>Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Evolution of water supply system</p> <p>Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations-factors affecting water demand, Design Period, Factors affecting the Design period, Population forecasting</p>
UNIT-II (10 Hrs)	<p>Surface Sources of Water: Lakes, Rivers, Impounding Reservoirs, Capacity of storage reservoirs, Mass curve analysis.</p> <p>Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from wells and infiltration galleries.</p> <p>Collection and Conveyance of Water: Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints</p>
UNIT-III (10 Hrs)	<p>Quality and Analysis of Water: Characteristics of water– Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sources with reference to quality- IS 10500 2012 and WHO guidelines for drinking water - Water quality standards for Agriculture, Industries and Construction</p>

UNIT-IV (10 Hrs)	Treatment of Water: Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration. Disinfection: Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odors- Removal of Iron and Manganese - Adsorption- Fluoridation and defluoridation– Aeration–Reverse Osmosis- Ion exchange– Ultra filtration.
UNIT-V (8 Hrs)	Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods
Text Books:	
1.	Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.
2.	Rural, Municipal and Industrial Water Management, KVSG Murali Krishna, Reem Publications, New Delhi, 2012
Reference Books:	
1.	Environmental Engineering – Howard S. Peavy, Donald R. Rowe, George Tchobanoglous – Mc-Graw-Hill Book Company, New Delhi, 1985
2.	Water Supply Engineering – P. N. Modi.
3.	Water Supply Engineering – B. C. Punmia
4.	Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
5.	Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2106	PC	--	--	3	1.5	20	30	3 Hrs.
SURVEYING FIELD WORK								
Course Objectives: Student shall be able to								
1.	Understand and apply the basic methods of Chain Surveying and Compass Surveying							
2.	Summarize the different methods of Plane Table Surveying							
3.	Observe and report the different types of Leveling							
4.	Study and identify the different methods of Theodolite surveying							
5.	Describe the procedures available in Total Station Instrument for surveying							
Course Outcomes: After the completion of the course student should be able to								
S.No	Outcome							Knowledge Level
1.	Apply the linear measurement in simple Boundary Surveys.							K3
2.	Identify direction of any line using compass survey							K3
3.	Relate the importance of Theodolite in Surveying							K3
4.	Apply Concepts of Tachometry in Surveying							K3
5.	Use the Total Station in Surveying							K3
LIST OF EXPERIMENTS								
1.	Study of chains and its accessories, Aligning, Ranging and Chaining and Chain Traversing							
2.	Compass Traversing – Measuring Bearings & arriving included angles							
3.	Levelling: Longitudinal & Cross section levelling for an open traverse							
4.	Theodolite: Distance between two in-accessible points by theodolite							
5.	Trigonometric Leveling - Heights and distance problem							
6.	Determination of Heights and distance using Principles of tacheometric surveying							
7.	Setting out a simple circular curve							
8.	Determine of area using total station							
9.	Traversing using total station							
10.	Contouring using total station							
11.	Stake out using total station							
12.	Distance, gradient, diff, height between two inaccessible points using total station							
Reference Books:								
1.	Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill							
2.	Surveying and levelling by R. Subramanian, Oxford university press, New Delhi							
3.	Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi							

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2107	PC	--	--	3	1.5	20	30	3 Hrs.
STRENGTH OF MATERIALS LAB								
Course Objectives: Student shall be able to								
1.	To test steel and wood for assessing their physical properties							
2.	To know the quality of steel and wood							
3.	To know the arch action in beams							
Course Outcomes: After the completion of the course student should be able to								
S.No	Outcome							Knowledge Level
1.	Conduct test and find Physical properties of steel and wood							K3
2.	Design the specimens for assessing a particular property of the materials with available machines							K3
3.	Decide the range of machine and set the machine accordingly by suitable modifications							K3
4.	Design experiments making use of various techniques of load measuring or deformation measuring instruments							K3
LIST OF EXPERIMENTS								
1.	Tension test on Mild Steel bar							
2.	Tension test on HYSD Steel bar							
3.	To determine Compressive strength of wood (parallel and perpendicular to grains)							
4.	To determine Modulus of rigidity of a spring							
5.	To determine Brinell's hardness & Rockwell hardness on mild steel and Aluminium Specimen							
6.	To determine Vicker's hardness on mild steel and Aluminium Specimen							
7.	To determine Impact strength of mild steel by Charpy test							
8.	To determine Impact strength of mild steel by Izod test							
9.	To determine shear strength of mild steel by Double shear test							
10.	Bending test on simply supported Steel /Wooden beams							
11.	Bending test on cantilever Steel / Wooden beams							
12.	Draw linear arch for the given two/three point loads							
13.	Verification of Maxwell's reciprocal theorem on simply supported beam							
Reference Books:								
1.	S.Ramamrutham ,Strength of materials, Dhanpat rai publishers							
2.	Dr. R.K.Bansal, Strength of materials , Laxmi Publications							

Code	Category	L	T	P	C	I.M	E.M	Exam
B19MC2103	MC	3	--	--	--	--	--	--
CONSTITUTION OF INDIA								
Course Objectives:								
1.	To Enable the student to understand the importance of constitution							
2.	To understand the structure of executive, legislature and judiciary							
3.	To understand philosophy of fundamental rights and duties							
4.	To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.							
5.	To understand the central and state relation financial and administrative.							
Course Outcomes: At the end of the semester/course, the student will be able to have a clear knowledge on the following:								Knowledge Levels
1.	Understand historical background of the constitution making and its importance for building a democratic India.							K2
2.	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.							K2
3.	Understand the value of the fundamental rights and duties for becoming good citizen of India.							K2
4.	Analyze the decentralization of power between central, state and local self-government.							K4
5.	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.							K3
6.	a) Know the sources, features and principles of Indian Constitution. b) Learn about Union Government, State government and its administration. c) Get acquainted with Local administration and Pachayati Raj. d) Be aware of basic concepts and developments of Human Rights. e) Gain knowledge on roles and functioning of Election Commission							K2
SYLLABUS								
UNIT-I (8 Hrs)	Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.							
Learning Outcomes: After completion of this unit student will								
<ul style="list-style-type: none"> ● Understand the concept of Indian constitution ● Apply the knowledge on directive principle of state policy ● Analyze the History, features of Indian constitution ● Evaluate Preamble Fundamental Rights and Duties 								
UNIT-II (8 Hrs)	Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;							
Learning outcomes:-After completion of this unit student will								
<ul style="list-style-type: none"> ● Understand the structure of Indian government ● Differentiate between the state and central government 								

	<ul style="list-style-type: none"> ● Explain the role of President and Prime Minister ● Know the Structure of supreme court and High court
UNIT-III (8 Hrs)	State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions
Learning outcomes:-After completion of this unit student will	
<ul style="list-style-type: none"> ● Understand the structure of state government ● Analyze the role Governor and Chief Minister ● Explain the role of state Secretariat ● Differentiate between structure and functions of state secretariat 	
UNIT-IV (8 Hrs)	Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy
Learning outcomes:-After completion of this unit student will	
<ul style="list-style-type: none"> ● Understand the local Administration ● Compare and contrast district administration role and importance ● Analyze the role of Myer and elected representatives of Municipalities ● Evaluate Zillapanchayat block level organisation 	
UNIT-V (8 Hrs)	Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women
Learning outcomes:-After completion of this unit student will	
<ul style="list-style-type: none"> ● Know the role of Election Commission apply knowledge ● Contrast and compare the role of Chief Election commissioner and Commissionerate ● Analyze role of state election commission ● Evaluate various commissions of viz SC/ST/OBC and women 	
References:	
1.	Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2.	SubashKashyap, Indian Constitution, National Book Trust
3.	J.A. Siwach, Dynamics of Indian Government & Politics
4.	D.C. Gupta, Indian Government and Politics
5.	H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6.	J.C. Johari, Indian Government andPolitics Hans
7.	J. Raj IndianGovernment and Politics
8.	M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9.	Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012
E-resources:	
1.	nptel.ac.in/courses/109104074/8
2.	nptel.ac.in/courses/109104045/
3.	nptel.ac.in/courses/101104065/
4.	www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution
5.	www.hss.iitb.ac.in/en/lecture-details



SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
Accredited by NAAC with 'A' Grade, All UG Programmes are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

CIVIL ENGINEERING (Accredited by NBA)

SCHEME OF INSTRUCTION & EXAMINATION

(Regulation R19)

II/IV B.TECH

II-SEMESTER

(With effect from 2019-2020 Admitted Batch onwards)

Subject Code	Name of the Subject	Category	Cr	L	T	P	Internal Marks	External Marks	Total Marks
B19 CE 2201	Engineering Geology	ES	3	3	--	--	25	75	100
B19 CE 2202	Structural Analysis-I	PC	3	3	--	--	25	75	100
B19 CE 2203	Concrete Technology	PC	3	3	--	--	25	75	100
B19 CE 2204	Hydraulics and Hydraulic Machinery	PC	3	3	--	--	25	75	100
B19 CE 2205	Environmental Engineering-II	PC	3	3	--	--	25	75	100
B19 CE 2206	Engineering Geology Lab	ES	1.5	--	--	3	20	30	50
B19 CE 2207	Fluid Mechanics and Hydraulic Machinery Lab	PC	1.5	--	--	3	20	30	50
B19 CE 2208	Concrete Lab	PC	1.5	--	--	3	20	30	50
B19 MC 2202	Professional Ethics and Human Values	MC	0	3	--	--	--	--	--
TOTAL			19.5	18	0	9	185	465	650

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2201	ES	3	--	--	3	25	75	3 Hrs.

ENGINEERING GEOLOGY

Course Objectives: To introduce basic geology and the principles of site investigation to civil engineering students that includes

1. Sedimentary processes (Weathering, erosion, deposition).
2. Geological Structures (Joint, veins, crack, faults, and fold), reasons of formation for each type and their effects on the engineering projects
3. The basics of Remote sensing and its applications in Civil Engineering
4. Types of Mass wasting, factors increasing instability and methods of stabilization
5. Types of Dams and Tunnels
6. Study ground water, factors affecting and the methods of searching for ground water

Course Outcomes: Upon successful completion of the course, the students will be able to

S.No	Outcome	Knowledge Level
1.	The course will provide the students with basic knowledge and understanding in the most central part of engineering geology, rock and soil.	K3
2.	Students should develop an appreciation of geologic processes and their influence civil engineering works	K2
3.	The course will give students an overview and an understanding of the engineering properties of rock and soil materials	K2
4.	Based on lectures and exercises, students will gain basic understanding of the importance of engineering geology related to technical issues during construction	K5
5.	Students will develop the ability to perform basic engineering geological assessments and analysis, and to understand the relevance of engineering geology in complex projects in and on solid rock	K3

SYLLABUS

UNIT-I (12 Hrs)	<p>Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies.</p> <p>Weathering: Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers</p>
UNIT-II (8 Hrs)	<p>Mineralogy and Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for Megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite. Ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures, textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their Megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.</p>

UNIT-III (10 Hrs)	Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.
UNIT-IV (10 Hrs)	Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.
UNIT-V (10 Hrs)	Geology of Dams, Reservoirs and Tunnels: Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunneling, effects, Lining of Tunnels. Influence of Geology for successful Tunneling
Text Books:	
1.	Engineering and General Geology by Parbin Singh – Katson Publishing House
2.	Engineering Geology by N.Chennakesavulu, Mc-Millan, India Ltd. 2005
3.	Principles of Engineering Geology by KVGK Gokhale. B.S Publications-2005
4.	Principles and Applications of Photo Geology by Pandey, Willey Eastern Limited
5.	Engineering Geology by Subinoy Gangopadhyay, Oxford University Press
Reference Books:	
1.	Fundamentals of Engineering Geology by P.G. Bell, B.S.P. Publications, 2012
2.	Engineering Geology and Geo-techniques by F.G. Bell
3.	Fundamentals of Engineering Geology by F.G. Bell, Button Wortus Landon

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2202	PC	3	--	--	3	25	75	3 Hrs.

STRUCTURAL ANALYSIS - I

Course Objectives:

1.	To familiarize with the deflection of simple determinate beams, frames & trusses
2.	To impart knowledge on various energy methods.
3.	To analyze the propped cantilever, fixed beams and continuous beams.
4.	To determine the deflections of determinate beams using energy methods.
5.	To draw the influence lines and moving loads for statically determinate beams & frames and To analyze the statically indeterminate structures using energy methods.

Course Outcomes: Upon successful completion of the course, the students will be able to

S.No	Outcome	Knowledge Level
1.	Determine deflections in determinate beams, frames & trusses by different methods and apply strain energy concept	K3
2.	Analyze propped cantilever and fixed beams for BM and SF.	K3
3.	Analyze different Continuous beams for BM and SF by different methods of analysis	K3
4.	Determine reactions, BM & SF in beams subjected to moving loads using ILD	K3
5.	Determine axial forces in trusses by using influence lines	K3

SYLLABUS

UNIT-I (12 Hrs)	<p>Deflections of Beams By using (i) Moment area method (ii) Conjugate beam method (iii) Unit load method (iv) Castigliano's theorem-II. Strain- energy due to (i) Axial load (ii) Bending Moment (iii) Shear force and (iv) Torque Deflections of Statically Determinate Structures: (a) Single storey, single bay rectangular portal frames using (i) Unit load method, (ii) Castigliano's theorem-II. (b) Trusses (having 9 members or less) using (i) Unit load method, (ii) Castigliano's theorem-II.</p>
UNIT-II (8 Hrs)	<p>Propped Cantilevers, Fixed Beams Analysis of propped cantilever by method of consistent deformation. Fixed Beams: Fixed end moments for beams of uniform section for different types of loading; Effect of sinking of support; effect of Rotation of a support; BMD for fixed beam</p>
UNIT-III (12 Hrs)	<p>Continuous Beams Analysis of continuous beams by 1. Theorem of three moments 2. Slope deflection method 3. Moment distribution method 4. Kani's method.</p>

UNIT-IV (10 Hrs)	Influence Lines and Moving Loads for beams Definition – Influence line for Reaction, SF and BM in case of simply supported and over hanging beams-Load position for Max SF at a section –Load position for max BM at a section- Single point load, U.D.L longer than the span, U.D.L. shorter than the span- Focal length. Introduction of moving loads – Max SF and BM at a given section and absolute Max SF and BM due to single concentrated load, U.D.L. longer than the span, U.D.L. shorter than the span, two point loads with fixed distance between them and several point loads, Maximum Bending moment at a section under a wheel load and absolute maximum Bending moment in the case of several wheel loads- Equivalent uniformly Distributed load.
UNIT-V (8 Hrs)	Influence Lines for Trusses Influence lines for axial forces in the members of determinate trusses (Through type and deck type bridges. Maximum axial force due to moving concentrated loads and UDL
Text Books:	
1.	Structural Analysis Volume _II by Vazrani and Ratwani , Khanna Publishers
2.	Indeterminate structures by C.K Wang
3.	Strength of Materials – Ramamrutham, Dhanpat Rai Publishing Company
4.	T.D.Gunneswara Rao and Andal Mudimby, Strength of Materials Fundamentals and Applications, Cambridge University Press
Reference Books:	
1.	Elementary strength of materials – Timoshenko and Young, East west press Pvt Ltd
2.	Strength of materials by Dr. R.K. Bansal, Laxmi Publications (p) Ltd
3.	Structural Analysis by T. S. Thandavamoorthy, Oxford University Press, 2011

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2203	PC	3	--	--	3	25	75	3 Hrs.
CONCRETE TECHNOLOGY								
Course Objectives:								
1.	To learn the concepts of Concrete production and its behavior in various environments							
2.	To learn the test procedures for the determination of properties of concrete							
3.	To understand durability properties of concrete in various environments.							
Course Outcomes: Upon successful completion of the course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Understand the basic ingredients like cement, sand and pebbles							K3
2.	Familiarize the basic ingredients of concrete and their role in the production of concrete and its behaviour by conducting tests							K2
3.	Testing the hardened concrete for different properties							K2
4.	Evaluate elasticity, shrinkage and creep properties							K5
5.	Design the concrete mix by standard mix designs and familiarize the basic concepts of special concrete, their production and applications							K3
SYLLABUS								
UNIT-I (12 Hrs)	<p>CEMENTS & ADMIXTURES: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, plasticizers, super-plasticizers, fly ash and silica fume.</p> <p>AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixing water</p>							
UNIT-II (8 Hrs)	<p>FRESH CONCRETE: Steps in manufacture of concrete –proportion, mixing, placing, compaction, finishing, curing including various types in each stage. Properties of fresh concrete -Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete , Ready mixed concrete, Shotcrete.</p>							
UNIT-III (10 Hrs)	<p>HARDENED CONCRETE: Water / Cement ratio – Abram’s Law – Gelspace ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.</p>							

	TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.
UNIT-IV (8 Hrs)	ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson’s ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.
UNIT-V (10 Hrs)	MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – concepts proportioning of concrete mixes by various methods – ACI method of mix design, British DoE method of mix design and BIS method of mix design. SPECIAL CONCRETES: Light weight aggregate concrete – Cellular concrete – No-fines concrete– High density concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C, Polymer concrete – Types of Polymer concrete – Properties of polymer concrete, High performance concrete ,self healing concrete
Text Books:	
1.	Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi
2.	Concrete Technology by M.S.Shetty. – S.Chand& Co.; 2004
Reference Books:	
1.	Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2.	Properties of Concrete by A.M.Neville – PEARSON – 4th edition,

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2204	PC	3	--	--	3	25	75	3 Hrs.

HYDRAULICS AND HYDRAULIC MACHINERY

Course Objectives:

1. Understand the fundamental concept of dimensional analysis, Model Laws and its applications
2. Understand the concept of Boundaries layers thickness and Determine drag force for various bodies, Lift force on circular cylinder and Airfoil
3. Understand the design philosophy and Characteristic curves of turbines and pumps
4. Understand the Uniform and Non – Uniform flow in Open Channel

Course Outcomes:

S.No	Outcome	Knowledge Level
1.	Apply the principles of dimensional homogeneity and Similarity laws for irrigation structures and fluid Machinery.	K3
2.	Determine the Drag and Lift force for fully submerged bodies.	K3
3.	Determine the discharge of most economical channel section for uniform flow in open Channels and Specific Energy , Critical flow , critical depth and critical velocity.	K3
4.	Determine length of surface profiles for G V F and Loss of head, height and length of hydraulic jump for Rapidly Varied flows.	K3
5.	Use momentum and energy principles for design of turbines and pumps.	K3
6.	Recommend suitable type of turbines and pumps for the given project.	K5

SYLLABUS

UNIT-I (10 Hrs)	<p>Dimensional Analysis and Similitude: Dimensional Homogeneity - Methods of Dimensional Analysis – Rayleigh’s Method – Buckingham’s π theorem – Superfluous and Omitted Variables - Similitude – Model Analysis – Dimensionless numbers – Similarity Laws – Model testing of partially submerged bodies – Types of models.</p> <p>Boundary Layer Theory: Introduction – characteristics of laminar boundary layer – boundary layer growth over a flat plate (without pressure gradient) – Boundary thicknesses – Stability parameter – Turbulent boundary layer – boundary layer separation – Boundary layer on rough surfaces – laminar sub layer.</p>
UNIT-II (10 Hrs)	<p>Flow past submerged bodies: Introduction – Types of Drag – Drag on a sphere – Drag on a cylinder – Von Karman Vortex Trail – Drag on a flat plate – Development of Lift on immersed circular cylinder, air foil – Magnus effect.</p> <p>Impact of Jets: Impulse momentum equation – Momentum Correction factor, Force on Stationary flat plate – moving flat plate - Force on Stationary curved vanes – moving curved vanes.</p>
UNIT-III (10 Hrs)	<p>Hydraulic Turbines: Introduction - Classification based on Head, Discharge, Hydraulic Action – Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbine, Choice of Type of Turbine, Component Parts & Working principle of a Pelton Turbine, Francis Turbine - Velocity Triangles - Hydraulic and Overall efficiencies.</p>

	Performance of turbines: Performance under Unit head, power and speed – Performance under specific conditions - Specific Speed and its importance. Performance Characteristic Curves – Operating Characteristic Curves – Cavitation - Draft Tube.
UNIT-IV (10 Hrs)	Centrifugal Pumps: Types of Pumps – Selection Criterion – Comparison between Centrifugal & Reciprocating Pumps - Centrifugal Pumps – Component Parts & Working Principle – Classification of Centrifugal pumps - Cavitation – Maximum Suction lift – NPSH. Specific Speed of pumps – Performance Characteristics of Centrifugal Pumps – Dimensionless characteristics – Constant efficiency curves of Centrifugal Pumps Reciprocating Pumps: Component Parts – Working Principle of single acting and double acting reciprocating pumps – Discharge Co-efficient, Volumetric efficiency and Slip. Work done and Power Input – Indicator Diagram, Effect of acceleration and friction on Indicator Diagram - Air Vessels.
UNIT-V (8 Hrs)	Flow through Open Channels: Classification of open channels, Uniform Flow: Chezy’s and Manning’s formula, Hydraulic mean depth, hydraulic radius. Most economical trapezoidal and rectangular channel section – Specific energy, Critical Flow. G.V.F: length of surface profile using step by step Method, $M_1, M_2, M_3, S_1, S_2, S_3$ CURVES. Steady Rapidly Varied Flow: Hydraulic Jump in a horizontal rectangular channel, Specific force Computation of energy loss.
Text Books:	
1.	Modi, P.N. & Seth, S.M. (2009), “Fluid Mechanics and Hydraulic Machinery”, Standard Book House, New Delhi, 19th Edition.
2.	Jain, A.K. (2008), “Fluid Mechanics”, Khanna Publishers, New Delhi, 4th Edition
Reference Books:	
1.	Kumar, K.L., Chand, S. & Co. (2008), “Engineering Fluid Mechanics”, EurasiaPublishing House (P) Ltd, New Delhi, 8 th Edition.
2.	Subramanyam, K. (2008), “Flow in Open Channels”, McGraw Hill Education, New Delhi, 3 rd Edition.
3.	Chow, V.T. (2009), “Open-Channel Hydraulics”, The Blackburn Press, Caldwell, NJ USA, 1 st Edition
4.	White, F. M. (2011) “Fluid Mechanics”, Tata McGraw Hill Publication, New Delhi, 7 th Edition
5.	Relevant NPTEL Courses

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2205	PC	3	--	--	3	25	75	3 Hrs.
ENVIRONMENTAL ENGINEERING-II								
Course Objectives:								
1.	The different aspects of collection, conveyance, treatment and disposal of sewage							
2.	The conventional treatment processes with the engineering specifications							
3.	The miscellaneous treatment unit operations with the design specifications							
Course Outcomes: Upon successful completion of the course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Apply the concepts of sewerage systems for design of a sewer							K3
2.	Choose the appropriate house plumbing systems for building better house drainage network							K3
3.	Make use of the quality to determine BOD content in waste water							K3
4.	Solve for the size of conventional treatment unit operations using the engineering principles							K3
5.	Solve for the size of miscellaneous treatment units using design specifications							K3
6.								
SYLLABUS								
UNIT-I (10 Hrs)	Sanitation- systems of sanitation- sewerage systems – Estimation of sewage flow and storm water – design of sewers – sewer types – Layout of sewer network – materials for sewers – cleaning and ventilation methods – sewer appurtenances							
UNIT-II (8 Hrs)	Pumping – necessity – pumping station – its location – functions – types of pumps – sewage and water pumping requirements- House drainage systems- traps – classification – drain pipes – plumbing systems – Layout of building drainage – storm water drainage							
UNIT-III (12 Hrs)	Quality of sewage – Sampling and analysis – decomposition – cycles of decomposition – BOD – COD – Layout of sewage treatment plant – F/M importance – preliminary treatment – screens – grit chamber – skimming tanks – Primary treatment – Sedimentation tanks							
UNIT-IV (10 Hrs)	Secondary treatment – Attached growth process – contact beds – intermittent sand filters – trickling filters – Suspended growth process – activated sludge process – Miscellaneous methods for sewage treatment – oxidation ponds – oxidation ditches – RBC’s – sewage lagoons – extended aeration process – septic tanks – imhoff tanks							
UNIT-V (8 Hrs)	Sewage disposal methods – natural and artificial methods – Sludge generation- characteristics – treatment – sludge disposal methods.							
Text Books:								
1.	S.K.Garg, Sewage disposal and Air pollution Engineering, Khanna Publishers							
2.	S.C.Rangwala, Water Supply and Sanitary Engineering, Charotar Publishers							
Reference Books:								
1.	Peavy, H.S.Rowe and Tchobanoglous, Environmental Engineering, Mc Graw Hill publishers							

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2206	ES	--	--	3	1.5	20	30	3 Hrs.
ENGINEERING GEOLOGY LAB								
Course Objectives: Student shall be able to								
1.	To identify the formation of minerals							
2.	To understand the mega-scopic identification of rocks and minerals							
3.	To understand the geological maps							
Course Outcomes: After the completion of the course student should be able to								
S.No	Outcome							Knowledge Level
1.	Elucidate the mega-scopic identification of minerals							K2
2.	Categorize the rocks according to mega-scopic description							K3
3.	Interpret geological knowledge in various sectors							K3
LIST OF EXPERIMENTS								
1.	Study of physical properties and identification of minerals						[CO1]	
2.	Megascopic identification of rocks and their Engineering properties						[CO2]	
3.	Description and Identification of Geomorphological models						[CO3]	
4.	Description and Identification of Structural geology models						[CO3]	
5.	Simple Structural Geology problems						[CO3]	
Reference Books:								
1.	Engineering and General Geology by Parbin Singh – Katson Publishing House							
2.	Engineering Geology by N.Chennakesavulu, Mc-Millan, India Ltd. 2005							

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2207	PC	--	--	3	1.5	20	30	3 Hrs.
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB								
Course Objectives: Student shall be able to								
1.	To verify the principles of channel flow in laboratory by conducting experiments							
2.	Aware of tests to identify the different types of flow measuring devices to measure flow in tanks, pipes and open channels							
3.	Aware of various types of pumps and turbines							
Course Outcomes: After the completion of the course student should be able to								
S.No	Outcome							Knowledge Level
1.	Illustrate Flow Measuring Devices used in pipes, channels and Tanks							K3
2.	Analyze characteristics of broad crested notch							
3.	Determine the coefficient of impact on a flat plate and curved vane by comparing the theoretical and actual forces by impact.							K3
4.	Analyze the working of the reciprocating pump and centrifugal pump and develop the characteristics of power input, head and efficiency under various discharges and plot the characteristic curves.							K4
5.	Determine the performance characteristics of pelton wheel turbine and develop the characteristic curves of unit discharge, unit power and unit head under varying unit speed							K3
6.	Determine the performance characteristics of Francis turbine and develop the characteristic curves of unit discharge, unit power and unit head under varying unit speed							K3
LIST OF EXPERIMENTS								
1.	Calibration of Venturi meter & Orifice meter							
2.	Determination of Coefficient of discharge for a small orifice and mouth piece by a constant head and variable head method.							
3.	Calibration of contracted Rectangular Notch and /or Triangular Notch							
4.	Determination of Coefficient of loss of head in a sudden contraction and friction factor							
5.	Verification of Bernoulli's equation							
6.	Impact of jet on vanes							
7.	Study of Hydraulic jump							
8.	Efficiency test on centrifugal pump							
9.	Efficiency test on reciprocating pump							
10.	Performance test on Pelton wheel turbine							
11.	Performance test on Francis turbine							
Reference books:								
1.	Hydraulics Fluid Mechanics and Fluid Machines, S.Ramamrutham, Dhanpat Rai Publishing Co.							
2.	Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications							

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CE2208	PC	--	--	3	1.5	20	30	3 Hrs.
CONCRETE LAB								
Course Objectives: Student shall be able to								
1.	To test ingredients of concrete for assessing their physical properties							
2.	To prepare and test concrete for studying fresh and hardened properties							
Course Outcomes: After the completion of the course student should be able to								
S.No	Outcome							Knowledge Level
1.	Conduct test and find Physical properties of cement, fine aggregates and coarse aggregates							K3
2.	Determine the values of physical properties and recommend their suitability for concrete production							K3
3.	Understand and determine workability of concrete by slump, compaction factor, flow table and Vee – Bee tests.							K3
4.	Evaluate hardened properties of concrete like compressive strength, split tensile strength and flexural strength							K5
LIST OF EXPERIMENTS								
I	TESTS ON CEMENT							
	1. Fineness of cement 2. Specific gravity of cement 3. Normal consistency of cement 4. Initial and final setting time 5. Compressive strength of cement for different grades of cement							
II.	TESTS ON AGGREGATE							
	6. Specific gravity and unit weight of coarse and fine aggregates 7. Sieve analysis of coarse and fine aggregates and classification as per IS 383. 8. Bulking characteristics of sand							
III.	TESTS ON FRESH CONCRETE							
	9. Workability tests on fresh concrete by using: (a) Slump cone (b) Compaction factor apparatus (c) Flow table (d) Vee-Bee consistometer							
IV	TESTS ON HARDENED CONCRETE							
	10. Strength tests on hardened concrete (a) Compressive strength (b) Split tensile strength (c) Flexural strength							
Reference Books:								
1.	Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi							
2.	Concrete Technology by M.S.Shetty. – S.Chand & Co.; 2004							

Code	Category	L	T	P	C	I.M	E.M	Exam
B19MC2202	MC	3	--	--	--	--	--	--
PROFESSIONAL ETHICS AND HUMAN VALUES								
(Common to CE & EEE)								
Course Objectives:								
1.	To create an awareness on Engineering Ethics and Human Values.							
2.	To instill Moral and Social Values and Loyalty.							
3.	To appreciate the rights of others.							
4.	To create awareness on assessment of safety and risk.							
Course Outcomes: Students will be able to:								Knowledge Level
1.	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field. Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships and field work.							K1&K2
2.	Identify the multiple ethical interests at stake in a real-world situation or practice and Articulate what makes a particular course of action ethically defensible.							K1&K2
3.	Assess their own ethical values and the social context of problems.							K3
4.	Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.							K3
5.	Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.							K4
SYLLABUS								
UNIT-I (8 Hrs)	Human Values: Morals, Values and Ethics-Integrity-Work Ethic-Service learning Civic Virtue Respect for others Living Peacefully Caring Sharing Honesty -Courage-Cooperation Commitment Empathy Self Confidence Character Spirituality.							
UNIT-II (8 Hrs)	Engineering Ethics: 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 Uses of Ethical theories Valuing time Cooperation Commitment.							
UNIT-III (8 Hrs)	Engineering as Social Experimentation: Engineering As Social Experimentation- Framing the problem- Determining the facts codes of Ethics- Clarifying Concepts- Application issues Common Ground -General Principles- Utilitarian thinking respect for persons.							
UNIT-IV (8 Hrs)	Engineers Responsibility for Safety and Risk: Safety and risk Assessment of safety and risk. Risk benefit analysis and reducing risk- Safety and the Engineer-Designing for the safety- Intellectual Property rights (IPR).							

UNIT-V (8Hrs)	Global Issues: Globalization- Cross-culture issues-Environmental Ethics- Computer Ethics Computers as the instrument of Unethical behavior Computers as the object of Unethical acts Autonomous Computers-Computer codes of Ethics- Weapons Development -Ethics and Research Analyzing Ethical Problems in research.
1.	"Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan- and, V.S.Senthil Kumar-PHI Learning Pvt Ltd-2009.
2.	"Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3.	"Ethics in Engineering" by Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill-2003.
4.	"Professional Ethics and Morals" by Prof.A.R.Aryasri, DhanikotaSuyodhana-Maruthi Publications.
5.	"Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-Laxmi Publications.
6.	"Professional Ethics and Human Values" by Prof.D.R.Kiran-
7.	"Indian Culture, Values and Professional Ethics" by PSR Murthy- BS Publication.
8.	Professional Ethics by R.Subramaniam - Oxford publications, New Delhi.