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(AUTONOMOUS)
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DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE-B.TECH-APHSE-2020

I-SEM- I Year

Sl.No	Subcode	Course Title	Hours per week			Credits
			L	T	P	
1	20BS1T1	Engineering Physics	3	0	0	3
2	20BS1T2	Ordinary Differential Equation and Calculus	3	0	0	3
3	20ES1T3	Electrical Circuit Analysis	3	0	0	3
4	20ES1T4	C Programming	3	0	0	3
5	20ES1T5	Engineering Graphics and Design	1	0	4	3
6	20BS1L1	Engineering/Applied Physics Lab	0	0	3	1.5
7	20ES1L2	C Programming Lab	0	0	3	1.5
8	20ES1L3	Engineering Workshop & ITWS Lab	0	0	3	1.5
		Total Credits				19.5

II-SEM- I Year

Sl.No	Subcode	Course Title	Hours per week			Credits
			L	T	P	
1	20HS2T1	Communicative Engilish-I	3	0	0	3
2	20BS2T2	Linear Algebra and Transformation	3	0	0	3
3	20BS2T3	Engineering Chemistry	3	0	0	3
4	20ES2T4	Python Programming	3	0	0	3
5	20ES2T5	Engineering Mechanics	3	0	0	3
6	20HS2L1	Communicative English Lab	0	0	3	1.5
7	20BS2L2	Engineering Chemistry Lab	0	0	3	1.5
8	20ES2L3	Phython Lab	0	0	3	1.5
9	20MC2T6	Environmental Studies	2	0	0	0
		Total Credits				19.5

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DEPARTMENT OF CIVIL ENGINEERING

III-SEM- II Year

Sl.No	Subcode	Course Title	Hours per week			Credits
			L	T	P	
1	20BS3T1	Numerical Analysis and Statistics	3	0	0	3
2	20CE3T2	Strength of Material	3	0	0	3
3	20CE3T3	Building Material and Construction	3	0	0	3
4	20CE3T4	Surveying and Geomatics	3	0	0	3
5	20CE3T5	Fluid Mechanics	3	0	0	3
6	20CE3L1	Surveying Field work –I lab	0	0	3	1.5
7	20CE3L2	Strength of Materials lab	0	0	3	1.5
8	20CE3L3	GIS Lab	0	0	3	1.5
9	20SO3T6A 20SO3T6B 20SO3T6C 20SO3T6D 20SO3T6E	1.Web and Mobile Development-1 2.Cloud Computing-1 3.Cyber Security-1 4.Data Analyst-1 5.Building Planning and Drawing	1	0	2	2
10	20MC3T7	Essence of Indian Traditional Knowledge	2	0	0	0
		Total Credits				21.5

Sl.No	Category	Course Code	Total Credits
1	Basic Science Course	BSC	3
2	Professional Core Course	PCC,PCC Lab	16.5
3	Skill Oriented Course	SOC	2
4		Total Credits	21.5

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IV-SEM- II Year

Sl.No	Subcode	Course Title	Hours per week			Credits
			L	T	P	
1	20ES4T1	Engineering Geology	3	0	0	3
2	20CE4T2	Structural Analysis -I	3	0	0	3
3	20CE4T3	Transportation Engineering -I	3	0	0	3
4	20CE4T4	Hydraulic and Hydraulic Machinery	3	0	0	3
5	20MC4T4	Managerial Economics and Financial Analysis	3	0	0	3
6	20ES4L1	Engineering Geology Lab	0	0	3	1.5
7	20CE4L2	Surveying Field work –II	0	0	3	1.5
8	20CE4L3	FM & HM Lab	0	0	3	1.5
9	20SO4T5A 20SO4T5B 20SO4T5C 20SO4T5D 20SO4T5E	1.Web and Mobile Development-2 2.Cloud Computing-2 3.Cyber Security-2 4.Data Analyst-2 5.Computer Aided Drawing -1	1	0	2	2
10	20MC4T6	Constitution of India	2	0	0	0
		Total Credits				21.5
		Internship 2 Months (Mandatory) during Summer Vacation				

Sl.No	Category	Course Code	Total Credits
1	Engineering Science Course	ESC,ESC Lab	4.5
2	Professional Core Course	PCC,PCC Lab	12
3	Humanities and Science	HS	3
4	Skill Oriented Course	SOC	2
		Total Credits	21.5

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DEPARTMENT OF CIVIL ENGINEERING

V-SEM- III Year

Sl.No	Subcode	Course Title	Hours per week			Credits
			L	T	P	
1	20CE5T1	Concrete Technology	3	0	0	3
2	20CE5T2	Structural Analysis -II	3	0	0	3
3	20CE5T3	Transportation Engineering -II	3	0	0	3
4	20OE5T4	Open Elective-I (Groundwater Development)	2	0	2	3
5	20PE5T5	Professional Elective –I (Design and Drawing Reinforced Concrete Structure)	3	0	0	3
6	20CE5L1	Concrete Technology Lab	0	0	3	1.5
7	20CE5L2	Transportation Engineering Lab	0	0	3	1.5
8	20SO5T6A 20SO5T6B 20SO5T6C 20SO5T6D 20SO5T6E	1.Web and Mobile Development-3 2.Cloud Computing-3 3.Cyber Security-3 4.Data Analyst-3 5. Computer Aided Drawing -2	1	0	2	2
9	20MC5T7	Professional Ethics & Human Values	2	0	0	
10	20SI5L7	Summer Internship	0	0	0	1.5
11		Total				21.5

Sl.No	Category	Course Code	Total Credits
1	Professional Core Course	PCC,PCC Lab	12
2	Professional Elective Course	PEC	3
3	Open Elective Course	OEC	3
4	Skill Oriented Course	SOC	2
5	Summer Internship	SI	1.5
		Total Credits	21.5

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DEPARTMENT OF CIVIL ENGINEERING

VI-SEM- III Year

Sl.No	Subcode	Course Title	Hours per week			Credits
			L	T	P	
1	20CE6T1	Geotechnical Engineering	3	0	0	3
2	20CE6T2	Water Resource Engineering -I	3	0	0	3
3	20CE6T3	Environmental Engineering	3	0	0	3
4	20PE6T4	Professional Elective –II (Design and Drawing Steel Structure)	3	0	0	3
5	20OE6T5	Open Elective-II (Traffic Engineering)	2	0	2	3
6	20CE6L1	Computer Aided Drawing Lab	0	0	3	1.5
7	20CE6L2	Environmental Engineering Lab	0	0	3	1.5
8	20CE6L3	Geotechnical Engineering Lab	0	0	3	1.5
9	20SO6T6A 20SO6T6B 20SO6T6C 20SO6T6D 20SO6T6E	1.Web and Mobile Development-4 2.Cloud Computing-4 3.Cyber Security-4 4.Data Analyst-4 5.Green Building	1	0	2	2
10	20MC6T7	Employability Skills	2	0	0	
		Total Credits				21.5
Industrial/Research Internship (Mandatory) 2 Months during summer vacation						

Sl.No	Category	Course Code	Total Credits
1	Professional Core Course	PCC,PCC Lab	13.5
2	Professional Elective Course	PEC	3
3	Open Elective Course	OEC	3
4	Skill Oriented Course	SOC	2
		Total Credits	21.5

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DEPARTMENT OF CIVIL ENGINEERING

VII-SEM- IV Year

Sl.No	Category	Course Title	Hours per week			Credits
			L	T	P	
1	20PE7T1	Professional Elective –III (Construction Technology and Management)	3	0	0	3
2	20PE7T2	Professional Elective –IV (Estimation Specification and Contract)	3	0	0	3
4	20PE7T3	Professional Elective –V (Water Resource Engineering-II)	3	0	0	3
5	20OE7T4	Open Elective-III (Prestressed Concrete)	2	0	2	3
6	20OE7T5	Open Elective-4(Solid and Hazardous waste Management)	2	0	2	3
7	20MC7T6	IPR & Patents	3	0	0	3
8	20SO7T7A 20SO7T7B 20SO7T7C 20SO7T7D 20SO7T7E	1.Web and Mobile Development-5 2.Cloud Computing-5 3.Cyber Security-5 4.Data Analyst-5 5.Advanced Foundation Engineering	1	0	2	2
9	20RI7L1	Research Internship	0	0	0	3
		Total Credits				23

Sl.No	Category	Course Code	Total Credits
1	Professional Elective Course	PEC	9
2	Open Elective Course	OEC	6
3	Humanities and Science	HS	3
4	Skill Oriented Course	SOC	2
5	Research Internship	RI	3
		Total Credits	23

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VIII-SEM- IV Year

Sl.No	Category	Course Title	Hours per week			Credits
			L	T	P	
1	20MP8P1	Main Project (Data Processing, Report Writing and MOOC)	0	0	0	12

Professional Electives				
Sl.No	**Professional Elective -I**	**Sl.No**	**Professional Elective -II**	
1	Design and Drawing Reinforced Concrete Structure	1	Design and Drawing Steel Structure	
2	Earthquake Resistance Design	2	Matrix analysis of structures	
3	Theory of Elasticity	3	Structural Dynamics	
4	Finite Element Methods	4	Sub Structure Design	
Sl.No	**Professional Elective -III**	**Sl.No**	**Professional Elective -IV**	
1	Construction Technology and Management	1	Estimation Specification and Contract	
2	Experimental Stress Analysis	2	Theory of plates and shells	
3	Repair and Rehabilitation of structure	3	Industrial structures	
4	Stability of structures	4	Earth Retaining Structure	
Sl.No	**Professional Elective -V**			
1	Water Resource Engineering-II			
2	Spatial Data Analysis			
3	Analysis and Design of tall building			
4	Advanced Pavement Design			
Open Electives				
	Open Elective-I		**Open Elective-II**	
1	Ground water Development	1	Advanced Structural Analysis	
2	Ground Improvement Techniques	2	Advanced Transportation	
3	Tall Building	3	Environmental Impact Assessment	
4	Advanced Hydrology	4	Traffic Engineering	
	Open Elective-III		**Open Elective-IV**	
1	Bridge Engineering	1	Plastic analysis and design	

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2	Soil Dynamics and Foundation	2	Solid Hazardous waste management
3	Prestressed Concrete	3	Waste Water Management
4	Water Resource system planning	4	Pavement Analysis and Design

Course Code	STRENGTH OF MATERIALS	L	T	P	C
20CE3T2	Maximum expected contact hours : **64**	**3**	**1**	**0**	**3**
	Prerequisites: **18BS1T4**				

PURPOSE: To know the basics of solid mechanics. To understand the concepts of mechanics of structures.

INSTRUCTIONAL COURSE OBJECTIVES

1	To introduce the concepts of stress, strain and elastic constants and their relations for use in elastic design of prismatic bars.
2	To familiarize with shear force, bending moment and torsion induced and shear stresses and bending stresses developed for different sections of beams and Shafts.
3	To impart the knowledge on calculating forces in pin-jointed plane frames.

COURSE OUTCOMES

1	Analyse and design the bars elastically by stress and strain relationship.
2	To Construct SF and BM diagrams for various beams carrying different types of loads.
3	Evaluate flexure and shear stresses for different beam sections.
4	Analyse and design shafts and springs using principle of torsion.
5	Determine the forces in frames by the method of joints and method of sections.

UNIT I: Simple Stresses And Strains And Strain Energy: Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section, Tapering bars – composite bars – Temperature stresses.

Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

UNIT II: Shear Force And Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam. Freely supported beam with end couple.

UNIT III: Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections. Strain energy due to bending.

UNIT IV: Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections, built up beams, shear centre.

UNIT V: Deflection Of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. Uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT VI: Thin And Thick Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders: Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage – Thick spherical shells.

TEXT BOOKS:
     1. Strength of Materials by Strength of materials, R. K. Rajput, S. Chand & Co, New   Delhi
     2. Strength of Materials by S. Ramamrutham,

REFERENCES:
     1. Strength of Materials by R.K Bansal, Lakshmi Publications

Course Code **20CE3T3**	**BUILDING MATERIALS AND CONSTRUCTION**	**L**	**T**	**P**	**C**
	Maximum expected contact hours : **64**	**3**	**1**	**0**	**3**
	Prerequisites: **NIL**				

PURPOSE: To get exposed to the glimpses of Civil Engineering topics that is essential for an Engineer.

INSTRUCTIONAL COURSE OBJECTIVES	
1	Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, walls, sloped and flat roofs.
2	The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes.
3	Imparting the students with the techniques of formwork and scaffolding.
4	The students should be exposed to classification of aggregates, moisture content of the aggregate.

COURSE OUTCOMES	
1	The student should be able to identify different building materials and their importance in building construction.
2	The student is expected to differentiate brick masonry, stone masonry construction and use of lime and cement in various constructions.
3	The student should have learnt the importance of building components and finishings.
4	The student is expected to know the classification of aggregates, sieve analysis and moisture content usually required in building construction.

UNIT I: 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. Qualities of bricks, tests and classification of bricks. Characteristics of good tile - manufacturing methods, types of tiles.uses materialsaluminium ,gypsum,glass and bituminous materials

UNIT II Masonry & wood: 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- Preservation of timber and advantages. Alternative materials for wood.galvanized iron, fiber Reinforced Plastics,steel

UNIT III: Lime, Cement and Concrete Lime- Sources of 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: 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.

UNIT V: Aggegates 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.

UNIT VI: Finishings 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.

TEXT BOOKS:
1. Building Materials, S. S. Bhavikatti, Vices publications House private ltd.
2. Building Construction, S. S. Bhavikatti, Vices publications House private ltd.

3. Building Materials, B. C. Punmia, Laxmi Publications private ltd.
4. Building Construction, B.C. Punmia, Laxmi Publications (p) 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.

Course Code	**SURVEYING & GEOMATRICS**	L	T	P	C
20CE3T4	Maximum expected contact hours : **64**	**3**	**1**	**--**	**3**
	Prerequisites :**NIL**				

PURPOSE: To measure the land area, to prepare map and to find out the elevation of a point for constructional purpose.	
INSTRUCTIONAL COURSE OBJECTIVES	
1	To introduce the students to basic principles of surveying, various methods of linear and angles measuring instruments and enable the students to use surveying equipments.
COURSE OUTCOMES	
1	To demonstrate the basic surveying skills
2	To use various surveying instruments.
3	To perform different methods of surveying.
4	To compute various data required for various methods of surveying.
5	To integrate the knowledge and produce topographical map.

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, levelling and Plane table surveying.

Measurement of Distances and Directions

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip – W.C.B systems and Q.B. system of locating bearings.

UNIT - II

Leveling- Types of levels, temporary and permanent adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction. Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas - Determination of areas consisting of irregular boundary and regular boundary.

Volumes -Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry,

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station-advantages and Applications. Introduction to Global Positioning System.

UNIT - V

Photogrammetry Surveying:

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

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.

REFERENCES:
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.

Course Code	**FLUID MECHANICS**	L	T	P	C
20CE3T5	Maximum expected contact hours : **64**	3	1	--	3
	Prerequisites: **Basics of Fluid Mechanism**				

PURPOSE: The purpose of this course is to get exposure about the application of hydraulic engineering in the field by means of studying the various devices, equipments, machinery, and structures.

INSTRUCTIONAL COURSE OBJECTIVES	
1	To derive the equation of conservation of mass and its application.
2	To solve kinematic problems such as finding particle paths and stream lines
3	To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems.
4	To analyze laminar and turbulent flows
5	To understand the various flow measuring devices
6	To study in detail about boundary layers theory

COURSE OUTCOMES	
1	Understand the various properties of fluids and their influence on fluid motion and analyse a variety of problems in fluid statics and dynamics.
2	Calculate the forces that act on submerged planes and curves.
3	Identify and analyse various types of fluid flows.
4	Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces.
5	Draw simple hydraulic and energy gradient lines.
6	Measure the quantities of fluid flowing in pipes, tanks and channels.

UNIT I: Introduction : Dimensions and units – Physical properties of fluids - specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

UNTI II: Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Equation of acceleration & types.

Fluid Kinematics: Description of fluid flow, Stream line, path line and streak line and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

UNIT III: Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line - Momentum equation and its application – forces on pipe bend. Energy correction

UNIT IV: Laminar Flow And Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Shear and velocity distributions, Laws of Fluid friction, Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydrodynamically smooth and rough flows.

Closed Conduit Flow: Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula, Hard- Cross Method,

UNIT V: Measurement of Flow: Pitot tube, Venturi meter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular, trapezoidal and Stepped notches - –Broad crested weirs.

UNIT VI: Boundary Layer Theory: Boundary layer (BL) – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers(no deviations)- BL in transition, separation of BL, Control of BL. flow around submerged objects-Drag and Lift- Magnus effect.

TEXT BOOKS:

1. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi
2. A text of Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi

REFERENCES:

1. Mechanics of Fluids, Merle C. Potter, David C. Wiggert and Bassem H. Ramadan, CENGAGE Learning
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, Oxford Higher Education.

Course Code	**SURVEYING FIELD WORK - I**	L	T	P	C
20CE3L1	Maximum expected contact hours : **30**	0	0	3	1.5

List of Field Works

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse)
5. Plane table survey; finding the area of a given boundary by the method of Radiation
6. Plane table survey; finding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling : Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling; Longitudinal Section and Cross sections of a given road profile.

Course Code	**STRENGTH OF MATERIALS LAB**	L	T	P	C
20CE3L2	Maximum expected contact hours : **30**	0	0	3	1.5

List of Lab Works
1. Tension test on Steel bar
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simple support beam
4. Torsion test
5. Hardness test
6. Compression test on wood or concrete
7. Impact test
8. Shear test
9. Verification of Maxwell's Reciprocal theorem on beams.
10. Use of Electrical resistance strain gauges
11. Continuous beam – deflection test.

List of Major Equipment:
1. UTM for conducting tension test on rods.
2. Steel beam for flexure test.
3. Wooden beam for flexure test.
4. Torsion testing machine.
5. Brinnell's / Rock well's hardness testing machine.
6. Setup for spring tests.
7. Compression testing machine.
8. Izod Impact machine.
9. Shear testing machine.
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup.

Electrical Resistance gauges

Course Code	GIS LAB	L	T	P	C
20CE3L3	Maximum expected contact hours : **30**	**0**	**0**	**3**	**1.5**

EXCERCISES IN GIS:

1. Georeferencing Map/Toposheet
2. Geodatabese Creation and Projection on map/ Toposheet
3. Digitization of Map/Toposheet
4. Creation of thematic maps.
5. Estimation of features and interpretation
6. Developing Digital Elevation model
7. Simple applications of GIS in water Resources Engineering & Transportation Engineering

Software: Arc GIS 10.1

Course Code **20CE4T2**	**STRUCTURAL ANALYSIS - I**	L	T	P	C
	Maximum expected contact hours : **64**	**3**	**1**	**0**	**3**
	Prerequisites :				

PURPOSE:

INSTRUCTIONAL COURSE OBJECTIVES	
1	To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
2	To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions.
3	The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.
4	The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warren trusses.

COURSE OUTCOMES	
1	Distinguish between the determinate and indeterminate structures.
2	Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure.
3	Estimate the bending moment and shear forces in beams for different fixity conditions.
4	Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.
5	Draw the influence line diagrams for various types of moving loads on beams/bridge.
6	Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.

UNIT – I Propped Cantilevers: Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

Fixed Beams – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support, effect of rotation of a support.

UNIT – II Continuous Beams: Introduction-Clapeyron's theorem of three moments-Analysis of continuous beams with constant moment of inertia with one or both ends fixed- continuous beams with overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and Bending moment diagrams.

UNIT-III Slope-Deflection Method: Introduction,sign conventions. derivation of slope deflection equation, application to continuous beams with and without settlement of supports.

UNIT – IV Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem- Deflections of simple beams and pin jointed trusses, Castigliano's second theorem-Statically indeterminate beam and portal frame.

UNIT – V Moving Loads: Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.

UNIT – VI INFLUENCE LINES: Definition of influence line for SF, Influence line for BM-load position for maximum SF at a section-Load position for maximum BM at a sections, single point load, U.D. load longer than the span, U.D. load shorter than the span-Influence lines for forces in members of Pratt and Warren trusses.

Text Books:
1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi.

2. 2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi.
3. Analysis of Structures- Vol. I & II, V.N. Vazirani and M.M. Ratwani, Khanna Publishers.

References:
1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications.
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.
3. Structural analysis by R.C. Hibbeler, Pearson, New Delhi.
4. Structural Analysis-I, Hemanth Patel, Yogesh Patel, Synergy Knowledgeware, Mumbai.
5. Structural Analysis I Analysis of Statically Determinate Structures, P. N. Chandramouli, Yesdee Publishing Pvt Limited, Chennai.

Course Code **20CE4T3**	**TRANSPORTATION ENGINEERING - I**	**L**	**T**	**P**	**C**
	Maximum expected contact hours : **64**	**3**	**1**	**0**	**3**
	Prerequisites :				

PURPOSE:	

INSTRUCTIONAL COURSE OBJECTIVES	
1	To impart different concepts in the field of Highway Engineering.
2	To acquire design principles of Highway Geometrics and Pavements
3	To learn various highway construction and maintenance procedures

COURSE OUTCOMES	
1	Plan highway network for a given area.
2	Determine Highway alignment and design highway geometrics
3	Design Intersections and prepare traffic management plans
4	Judge suitability of pavement materials and design flexible and rigid pavements
5	Construct and maintain highways

UNIT I Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT – II Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment-Gradients- Vertical curves.

UNIT – III Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road
Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC Method.

UNIT – IV, Highway Materials: Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

UNIT – V, Design Of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors ***Flexible Pavements****:* Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.
Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

UNIT – VI Highway Construction and Maintenance: Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Construction of Cement Concrete Pavements. Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing pavements

TEXT BOOKS:

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.
2. Traffic Engineering and Transportation Planning, Kadiyali L.R Khanna Publishers.

REFERENCES:

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi.
2. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi.
3. Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi.
4. Transportation Engineering - An Introduction, JotinKhisty C, Prentice Hall, Englewood Cliffs, New Jersey.
5. Traffic & Highway Engineering by Nicholas J. Garber, Lester A. Hoel, Fifth Edition, published in 2015, CENGAGE Learning, New Delhi.
6. Transportation Engineering and Planning, Papacostas C.S. and P.D. Prevedouros, Prentice Hall of India Pvt.Ltd; New Delhi.
7. Highway Engineering, Srinivasa Kumar R, Universities Press, Hyderabad
8. Practice and Design of Highway Engineering, Sharma S. K., Principles, S. Chand & Company Private Limited, New Delhi.
9. Highway and Traffic Engineering, Subhash C. Saxena, CBS Publishers, New Delhi.
10. Transportation Engineering Volume I by C. Venkatramaiah, Universities Press, New Delhi.

Course Code **20CE4T4**	**HYDRAULICS AND HYDRAULIC MACHINERY**	**L**	**T**	**P**	**C**
	Maximum expected contact hours : **64**	**3**	**1**	**0**	**3**
	Prerequisites :				

PURPOSE:	

INSTRUCTIONAL COURSE OBJECTIVES	
1	To study about uniform and non uniform flows in open channel and also to learn about the characteristics of hydraulic jump
2	To introduce dimensional analysis for fluid flow problems.
3	To understand the working principles of various types of hydraulic machines and Pumps.
COURSE OUTCOMES	
1	Solve uniform and non uniform open channel flow problems.
2	Apply the principals of dimensional analysis and similitude in hydraulic model testing.
3	Understand the working principles of various hydraulic machineries and pumps.

UNIT – I UNIFORM FLOW IN OPEN CHANNELS:
Types of channels –Types of flows - Velocity distribution – Energy and momentum correction factors – Chezy's, and Manning's formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth

UNIT II NON-UNIFORM FLOW IN OPEN CHANNELS: Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT – III HYDRAULIC SIMILITUDE: Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

UNIT – IV BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat , inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.

UNIT – V HYDRAULIC TURBINES – I: Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines. Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity-cavitation.

UNIT – VI CENTRAIFUGAL-PUMPS: Pump installation details-classification-work done-Manometric head-minimum starting speed-losses and efficiencies-specific speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves- NPSH- Cavitation. **RECIPROCATING PUMPS:** Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

Text Books:
1. Open Channel flow, K. Subramanya, Tata McGraw Hill Publishers.
2. A text of Fluid mechanics & hydraulic machines, R.K. Bansal, Laxmi Publications New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

References:
1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P, OJHA, R.P.N. Chandramouli, Oxford higher education BERNDTSSON
3. 3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Higher Education.

Course Code	**ENGINEERING GEOLOGY**		L	T	P	C
20CE4T1	Maximum expected contact hours : **64**		**3**	**1**	**0**	**3**
	Prerequisites :					

PURPOSE:	

INSTRUCTIONAL COURSE OBJECTIVES	
1	To introduce the Engineering Geology as a subject in Civil Engineering
2	To enable the student to use subject in civil engineering applications.
3	To know the Geological history of India.
COURSE OUTCOMES	
1	Identify and classify the geological minerals
2	Measure the rock strengths of various rocks
3	Classify and measure the earthquake prone areas to practice the hazard zonation
4	Classify, monitor and measure the Landslides and subsidence
5	Prepares, analyses and interpret the Engineering Geologic maps
6	Analyses the ground conditions through geophysical surveys.
7	Test the geological material and ground to check the suitability of civil engineering project construction.
8	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc...

UNIT-I: Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies. **Weathering:** Weathering of rocks, Geological agents, weathering process of Rock, River process and their development.

UNIT-II Mineralogy And Petrology: Definitions of mineral, Structures of silicates and rock, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks, Common rock forming minerals are Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and other 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 and their importance in Civil Engineering.

UNIT-III 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–Indian stratigraphy. Aims of statigrtaphy, Principles, Geological time scour, Geological division in India, Major stratigraphic units in India.

UNIT-IV 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. Case studies.

UNIT-V 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-VI Geology of Dams, Reservoirs And Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Life of Reservoirs Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

Text Books:
1. Engineering Geology, N. Chenn Kesavulu, Laxmi Publications, 2nd Edition, 2014.
2. Engineering Geology, Subinoy Gangopadhay, Oxford University press.

References:

1. Engineering Geology, D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. Engineering Geology, Vasudev Kanithi, University Press.
3. Engineering Geology for Civil Engineers P. C. Varghese, PHI learning pvt. Ltd.
4. G Fundamentals of Engineering Geology' P.G. Bell, B. S. P. Publications, 2012
5. Geology for Engineers and Environmental Society, Alan E Kehew, person publications, 3rd edition.
6. Engineer's Geology by S. K. Duggal, H.K. Pandey, N. Rawd, McGraw Hill education.
7. Engineering Geology, K. S. Valdiya, McGraw Hill.
8. Environmental Geology, K. S Valdiya, Mcgraw Hill Publications, 2nd Edition.

Course Code	**SURVEY FIELD WORK- II**	**L**	**T**	**P**	**C**
20CE4L2	Maximum expected contact hours : **30**	**0**	**0**	**3**	**1**

List of Experiments

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of
   repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tacheomatric Survey: Heights and distance problems using tacheomatric principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station: Introduction to total station and practicing setting up, levelling up and
   elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station: Traversing
10. Total Station: Contouring
11. Total Station: Determination of Remote height.
12. Total Station: distance between two inaccessible points.

Note: Any 10 field work assignments must be completed**.**

Course Code	**FM & HHM LABORATORY**	L	T	P	C
20CE4L3	Maximum expected contact hours : **30**	**0**	**0**	**3**	**1**

List of Experiments
1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head
   method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Study of Hydraulic jump.
9. Performance test on Pelton wheel turbine
10. Performance test on Francis turbine.
11. Efficiency test on centrifugal pump.
12. Efficiency test on reciprocating pump.

List of Equipment:
1. Venturimeter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal and Reciprocating pumps.

Course Code	**ENGINEERING GEOLOGY LABORATORY**	L	T	P	C
20CE4L1	Maximum expected contact hours : **30**	0	0	3	1
	Prerequisites :				

PURPOSE:

INSTRUCTIONAL COURSE OBJECTIVES	
1	To identify the mega-scopic types of Ore minerals & Rock forming minerals.
2	To identify the mega-scopic types of Igneous, Sedimentary, Metamorphic rocks.
3	To identify the topography of the site & material selection.

COURSE OUTCOMES	
1	Identify Mega-scopic minerals & their properties.
2	Identify Mega-scopic rocks & their properties.
3	Identify the site parameters such as contour, slope & aspect for topography.
4	1. Know the occurrence of materials using the strike & dip problems.

LIST OF EXPERIMENTS
1. Physical properties of minerals:
a) Mega-scopic identification of Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc...
b) Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc...
2. Megascopic description and identification of rocks.
a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc...
b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc...
c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotiteschist, Marble, Khondalite, etc...
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests. 7. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

LAB EXAMINATION PATTERN:
1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

REFERENCE BOOKS:
1. Applied Engineering Geology Practical, M. T. Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009.

Course Code **20BS3T1**	**NUMERICAL ANALYSIS AND STATISTICS**	L	T	P	C
	Maximum expected contact hours : **64**	**3**	**1**	**--**	**3**
	Prerequisites : **Basics Of statistics**				

PURPOSE: Fundamentals of this course useful in Engineering subjects

INSTRUCTIONAL COURSE OBJECTIVES

1	To acquaint students with the fundamental concepts of probability and statistics and to develop an understanding of the role of statistics in engineering
2	Introduce numerical techniques to solve the real world applications

COURSE OUTCOMES

1	Examine, analyze, and compare various Probability distributions for Discrete random variable
2	Examine, analyze, and compare various Probability distributions for continuous random variable
3	Describe and compute confidence intervals for the mean of a population. Describe and compute confidence intervals for the proportion and the variance of a population
4	Test the hypothesis concerning mean, proportion and variance and perform ANOVA test.
5	Fit a curve to the numerical data and establish a relationship between two are more variables.
6	Preparing different control charts and check whether the process is in control or not

UNIT I: Discrete Random variables and Distributions: Introduction-Random variables- Discrete Random variable-Distribution function- Expectation-Moment Generating function Moments and properties. Discrete distributions: Binomial, Poisson and Geometric distributions and their fitting to data.

UNIT II: Continuous Random variable and distributions: Introduction-Continuous Random variable-Distribution function- Expectation-Moment Generating function-Moments and properties. Continuous distribution: Uniform, Exponential and Normal distributions, Normal approximation to Binomial distribution -Weibull, Gamma distribution.

UNIT III: Sampling Theory: Introduction - Population and samples- Sampling distribution of means (s known)-Central limit theorem- t-distribution- Sampling distribution of means (s unknown)- Sampling distribution of variances-Chi-Square and F-distributions- Point estimation- Maximum error of estimate - Interval estimation.

UNIT IV: Tests of Hypothesis: Introduction –Hypothesis-Null and Alternative Hypothesis-Type I and Type II errors –Level of significance - One tail and two-tail tests-Tests concerning one mean and proportion, two means- Proportions and their differences- ANOVA for one-way and two-way classified data.

UNIT V: Curve fitting and Correlation: Introduction - Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares-Goodness of fit. Correlation - Linear Regression and Multiple Regression

UNIT VI: Statistical Quality Control Methods: Introduction - Methods for preparing control charts – Problems using x-bar, R charts, Sigma Chart and attribute charts.

TEXT BOOKS:
1. Jay l.devore, Probability and Statistics for Engineering and the Sciences.8th edition,Cengage.
2. Richards A Johnson, Irvin Miller and Johnson E Freund. Probability and Statistics for Engineering, 9th Edition,PHI.

REFERENCE BOOKS:

1. Shron L.Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and   the Scientists,8th Edition, Pearson 2007.
2. William Menden Hall, Robert J. Bever and Barbara Bever, Introduction to probability   and statistics, Cengage learning.2009
3. Sheldon, M. Rosss, Introduction to probability and statistics Engineers and the   Scientists, 4th edition, Academic Foundation,2011
4. Johannes Ledolter and Robert V.Hogg, Applied statistics for Engineers and Physical   Scientists, 3rd Edition, Pearson,2010