B.TECH - CIVIL ENGINEERING

Syllabus with Course Outcomes

(w.e.f. 2015-16 and Applicable for the batches admitted for 2015-16 and 2016-17)

DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY DEPARTMENT
RAJASTHAN TECHNICAL UNIVERSITY KOTA
RAJASTHAN, INDIA-324010

3CEU01: STRENGTH OF MATERIALS – I

B. Tech. (Civil) 3rd semester   **Max. Marks: 100**

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to objective, scope and outcome of the subject.	1
I	**Simple Stresses and Strains:** Concept of stress and strain in three dimensions and generalized Hooke's law; Young's modulus; Tension test of mild steel and other materials: true and apparent stress, ultimate strength, yield stress and permissible stress;	4
I	Stresses in prismatic & non prismatic members and in composite members; Thermal stresses; Shear stress, Shear strain, Modulus of rigidity, Complementary shear stress; Poisson's ratio, Volumetric strain, Bulk modulus, relation between elastic constants; Stresses in composite members, Compatibility condition	5
II	**Compound Stress:** Two dimensional stress system: stress resultant, principal planes and principal stresses, state of pure shear maximum shear stress, Mohr's circle & it's application. **Moment of Inertia**: Polar and product moment of inertia, Principal axes and principal moment of inertia	7
III	**Columns:** Short and long columns, slenderness ratio, crushing and buckling of column, short column subjected to axial and eccentric loads; Euler's theory and its limitation, concept of effective length of columns; Rankine & Secant formulae.	5
III	**Membrane Analysis:** Stress and strain in thin cylindrical & spherical shells under internal pressures.	2
IV	**Bending of Beams:** Types of supports, support reactions, determinate and indeterminate structures, static stability of plane structures.	3
IV	Bending moment, Shear force and Axial thrust diagrams for statically determinate beams subjected o various types of loads and moments, Point of Contra-flexure, relation between load, SF and BM	5
V	**Theory of simple bending**: Distribution of bending and shear stresses for simple and composite sections	8
	TOTAL	40

TEXT BOOKS:
1. Mechanics of Structures Vol. I & II by S.B Junarkar, Charotar Publishing House, Anand.
2. Strength of Materials & Mechanics of Structures: Vol. I, II by Dr. B.C. Punmia Laxmi Publications (p) Ltd.

REFERENCE BOOKS:
1. Strength of Material by Singer and Pytel, Harper Collins Publishers.
2. Elements of Strength of Materials by Timoshenko & Young, Mc Graw Hill Book Co.
3. Mechanics of Structures by Timoshenko & Gere, CBS Publishers and Distributers.

	COURSE OUTCOMES
1	Students will be able to know about stresses and strains and their applications.
2	Students will be able to know about two dimensional stress systems, Mohr's circle and about short and long columns, slenderness ratio, Rankine and Secant formulae.
3	Students will be able to know about centroid and moment of inertia of various sections, radius of gyration, polar moment of inertia and simple pin jointed trusses and their analysis and introduction to computer methods.
4	Students will be able to know about various types of supports, reactions, determinate and indeterminate structures and for various types of loads and moments.
5	Students will be able to know about distribution of bending and shear stress for simple and composite section and some idea about unsymmetrical bending.

3CEU02: CIVIL ENGINEERING MATERIALS

B.Tech. (Civil) 3rd semester   **Max. Marks: 100**

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to objective, scope and outcome of the subject.** **Stones:** Source and types of stones, various standard test on building stones including compressive strength, water absorption, durability, impact value, tensile strength. Identification, Selection criteria and uses of common building stones. Dressing of stones.	8
II	**Clay Products** : Manufacturing of Bricks. Types and properties of bricks and their determination as per IS code such as water absorption, compressive strength, effloresces, dimension and tolerance test. Types of Tiles, Standard tests for tiles as per IS code such as water absorption, tolerance, impact value, glazing. Fly Ash: Properties, classification, use of fly-ash in manufacturing of bricks & cement.	8
III	**Cement & Lime :** Raw materials, chemical composition and manufacturing process of cement. Basic compounds (Bouge's compounds) of cement and their role, types of cement. Setting and hardening of cement, physical properties of cement, Various standard tests on Portland cements, as per IS code including consistency, setting time, fineness, soundness and strength.	5
III	**Lime**: Classification as per IS, Manufacturing process, properties, standard tests of lime. Use of lime in construction. Gypsum, properties and use, Plaster of Perris.	3
IV	**Mortar and Plaster:** types of sand, bulking of sand, tests for sand, classification, mortar preparation methods**:** Functions and tests & their uses in various types pointing & plastering.	3
IV	**Timber & Steel:** Definitions of related terms, classifications and properties, defects in wood, conversion of wood, seasoning, preservation, fire proofing, Ply woods, fiber boards,. Steel: properties, types mild steel and HYSD steel and their use, common tests on steel various types of paints and Varnishes; white wash and distempers and their application. .	5
V	**Environmental friendly Building material:** Concept of embodied energy of materials, energy used in transportation and construction process. Natural	5

material like bamboo, rammed earth, stones, stabilized blocks; supplementary cementious materials like blast furnace slag, silica fume, rice husk ash,; building materials from agro and industrial wastes.		
Miscellaneous: Properties, types and uses of glass, aluminum, Asbestos, G.I., plastics in construction.		**3**
	TOTAL	**40**

TEXT BOOK: 1. Building Materials by Prabin singh; S.K.Kataria & Sons., 2012

REFERENCE BOOKS:

SN	Name of Authors /Books /Publisher	Year of Publication
1	"Affordable Housing", by B.N.Moolchandani, Published by Indian Building Congress, Delhi.	2014
2	Building Materials:Products, Properties and Systems by Ghambir,Tata Mc Graw Hill, Delhi	2010
3	Construction Materials: Their nature & Behaviour by J.M. Illston; E& FN Spon	2003
4	Building Materials by S. Duggal; New Age International Publishers.	2006
5	Materials for Civil and Construction Engineers, by Michale, S .Mamlouk and Jhon P.Zaniewski, Pearson Noida.	2011

COURSE OUTCOMES	
1	Student will be able to differentiate between different types of stones (rock) and they can choose types of stone as per requirement.
2	Students can check different types of bricks, their quality, tiles of different types and their use at different places.
3	Student will be able to check quality of cement and lime to be used as binding material.
4	Student will be able to prepare different type of mortar and plaster to check their qualities and can be check type of defect in wood can select types of steel as per requirement.
5	Student will be able to understand the effect of building material on environment, use of different friendly materials and will be able to use of different waste material.

3CEU03: ENGINEERING GEOLOGY

B.Tech. (Civil) 3rd semester   **Max. Marks: 100**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to objective, scope and outcome of the subject.	**1**
I	**General Geology:** Branches and Scope of Geology, Internal Structure of the Earth, Types of Weathering & Geological work of natural agencies like River & Wind. Geological Time Scale. Physical Properties of Minerals.	**8**
II	**Petrology:** Formation, Texture, Structure and Classification of Igneous, Sedimentary and Metamorphic Rocks. Engineering Properties of Rocks for Building & Road Material. Laboratory and Field & in-situ Test for Site Construction.	**8**

III	**Structural Geology:** Causes, Terminology, Classification, Recognition, Effects and Engineering consideration of Fold, Fault, Joints and Unconformities. Dip & Strike Problems.		7
IV	**Engineering Geology:** Geophysical methods as applied to Civil Engineering for Subsurface Analysis (Electrical and Seismic methods). Terminology, Types and Geological consideration for site selection of Dam & Tunnel.		8
V	**Remote Sensing & GIS:** Remote Sensing & GIS System, Nature of Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interactions with Earth's Surface Materials, Remote Sensing Platforms & Sensor's Characteristics. Application, Advantages and Limitations of Remote Sensing and GIS in Various fields of Civil Engineering.		8
		TOTAL	40

Text Book: 1. Parbin Singh-A Text Book of Engineering & General Geology- S.K.Kataria & sons

REFERENCE BOOKS:

1. S.K.Garg- Physical & Engineering Geology- Khanna Publishers
2. N Chenna Kesavulu- A Text book of Engineering Geology- Macmillan India Ltd.
3. M.T.Maruthesha Reddy- A Text book of Applied Engineering Geology- New Age International Publisher
4. Remote Sensing and GIS: B.Bhatta- Oxford Publishers.

COURSE OUTCOMES	
1	Students will understand Importance of Geology during Planning, Design and Construction of any Engineering Projects.
2	Students can select best suitable rocks for Civil Engg. Projects.
3	Subject will provide strength of rocks due to presence of various Structural features.
4	Subject will assist the site selection for Civil Engg. Projects
5	Remote Sensing & GIS recognized as supporting tools for Planning, monitoring and managing the appropriate utilization of the earth resources in multidisciplinary applications.

3CEU04: CONSTRUCTION TECHNOLOGY

B.Tech. (Civil) 3rd semester **Max. Marks: 100**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to objective, scope and outcome of the subject.** **Building Requirements & Construction System:** Building components, their functions and requirements, types of construction, load bearing construction and framed structure construction. Lift slab construction. Prefabricated/precast construction; advantages & disadvantage of prefabrication.	2
	Temporary structures: Types & methods of shoring, underpinning and scaffolding.	1
	Foundation & Site Preparation: Purpose, types of foundation, depth of foundation, Sequence of construction activity and co-ordination, site clearance, marking, foundation plan,	2

	Brick and Stone Masonry: Basic principle of sound masonry work, different types of bonds, relative merits merit and demerits of English, single Flemish and double Flemish bond. Comparison between stone and brick masonry. General principles, classification of stone masonry	**4**
II	**Damp Proofing:** Causes of dampness, effects of dampness methods and material for damp proofing DPC treatment in buildings, methods and materials for anti termite treatment. **Joints :** Requirements, types and material used, construction details. Grouting of Joints of Precast reinforced Concrete Structures.	**3**
	Arches and Lintels : Terms used, types of arches and their construction detail, types of lintels and constructions. thin precast RCC lintels in Brick walls. **Partition Wall :** Types, purpose and use of partition wall.	**3**
	Stairs : Terms used, requirements of good staircase, classification, construction details and suitability of different types of stairs, lifts and lamps.	**3**
III	**Fabrication and Erection Work :** Fabrication of Structural steel at slopes and sites, Handling and transportation of units to be erected, Erection of Fabricated steel structures, Prefabricated/precast construction; relative advantages & disadvantage and various precast units & Erection of Precast reinforced Concrete Structures.	**2**
	Ground & Upper floors : Floor components and their junctions, selection of flooring and floor types, construction details of ground and upper floors, merits and demerits	**3**
	Roof and Roof Covering : Purposes, classification of roofs, terms used, types of pitched roofs, trussed roofs specially king port, queen port, steel roof trusses, details of steel roof trusses, method of construction, roof covering materials for pitched roofs. Thin R.C. ribbed slab for floors & roofs. Precast R.C. plank flooring/roofing.	**3**
IV	**Advance Construction Equipments** Different types of construction equipments viz. Earth moving equipments & their outputs, Dewatering equipments, Pumping equipments, Grouting equipments, Pile Driving equipments, Compaction equipments, Concreting equipments.	**7**
V	**Equipment Management in Construction Projects** Forecasting equipment requirements, Output and capacity of equipments, Selection of equipments, Spare-parts management, Owning Costs-investment costs, depreciation, major repair cost, Operation Cost & Its types. Investment Cost, Cost of Repairs, Overheads Cost accounting, Break-even point theory, Replacement of equipment. Maintenance management-types of maintenance, breakdown maintenance, preventive maintenance & its functions.	**7**
	TOTAL	**42**

Text Book: 1. Construction Equipments & Management by R.L. Purifoy, Tata Mc Graw Hill.

REFERENCE BOOKS

1. "Affordable Housing", by B.N.Moolchandani, Published by Indian Building Congress, Delhi, 2014
2. Construction Technology by Subir K. Sarkar & Subhajit Saraswati, Oxford University Press
3. Building Construction by Bindra & Arora; Dahnpat Rai & Sons.
4. Construction Equipments by Mahesh Verma, Metropolitan Book Co.
5. Construction Equipments and its Management by S.C.Sharma, Prentice Hall of India (PHI).

COURSE OUTCOMES	
1	Student will be able to know the building requirement and construction, site preparation, brick and stone masonry.
2	Student will be able to know the damp proofing, joints, arches and lintel, partition wall and stairs.
3	Student will be able to learn about fabrication and erection work, ground and upper floor, material used for roof covering.
4	Student will be able to learn the advance construction equipment and their uses in construction technology.
5	Student will be able to learn the equipment management in construction projects.

3CEU05: FLUID MECHANICS

B.Tech. (Civil) 3rd semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to objective, scope and outcome of the subject.	1
I	**Fluids**: Definition, Ideal fluids, real fluids, Newtonian and non-Newtonian fluids.	2
	Properties of Fluids: Units of measurement, Mass density, Specific weight, Specific volume, Specific Gravity, Viscosity, Surface tension and Capillarity, Compressibility and Elasticity.	4
II	**Hydrostatics :** Pressure at a point in a static fluid; pressure variation in an incompressible static fluid; atmospheric pressure, Gauge pressure, vacuum pressure, absolute pressure, Manometers Bourdon pressure gauge.	4
	Buoyancy: Forces acting on immersed plane surface. Centre of pressure, forces on curved surfaces. Conditions of equilibrium for floating bodies, meta-centre and met centric height experimental and analytical determination of met centric height.	4
III	**Equilibrium of Fluid particles and flow**: Fluid mass subjected to horizontal and vertical acceleration and uniform rotation.	2
	Hydro-kinematics : Types of Flows : Steady and unsteady, uniform and non-uniform, stream lines, path lines, stream tubes, principles of conservation of mass, equation of continuity, acceleration of fluid particles local and connective, Rotational and irrational motions, free and forced vortex, circulation and voracity velocity potential and stream function, elementary treatment of flow net. Euler's equations of motion and integration of Euler's equations, Bernoulli's equation for incompressible Fluids, assumptions in Bernoulli's equation, Energy correction factor.	7
	Applications of Bernoulli's equation: Pitot tube, Venturimeter, orifice meter, orifices & mouth pieces, time of emptying of tanks by orifices, sharp edged rectangular, triangular and trapezoidal notches, Francis formula. Velocity of approach. End contractions Cippoletti Weir, time of emptying reservoirs by weirs.	4
IV	**Momentum Equation and its Application:** Development of momentum equation by control volume concept, Momentum correction factor, applications – Borda's mouth pieces, sudden enlargement of flow, pressure on flat plates, Nozzles.	4

V	**Flow Through Pipes:** Laminar flow, Reynolds experiment, transition from laminar to turbulent flow. Turbulent Flow: Laws of fluid friction, friction factor Moodys diagram, loss of head due to friction and other causes. Hydraulic gradient, total energy line Chezy's, Darcy's and Manning's formula, flow through parallel pipes and pipes in series, flow through branched pipes. Flow along a bypass. Power transmission through pipe, condition for maximum power. Elementary water hammer concept.	**8**
	TOTAL	**40**

Text Book: 1. Fluid Mechanics by Modi & Seth, Standard Publishers, Delhi.

REFERENCE BOOKS

1-Fluid Mechanics by Dr. K.R. Arora, Standard Publishers and Distributers, Delhi.
2- Fluid Mechanics by Dr. R.K. Bansal, Laxmi Publication (P) Ltd.
3. Fluid Mechanics by H.M.Raghunath, CBS Publishers and Distributers.
4. Fluid Mechanics & Machinery by C.S.P.Ojha, R.Berndtsson and P.N.Chandramauli, Oxford Publishers, Delhi.

COURSE OUTCOMES	
1	To apply basic fluid properties, static fluid properties, buoyancy principle and acceleration of fluid mass.
2	To analyse kinetics of fluid flow by using conservation of mass and classify various types of flow.
3	To analyse dynamics of fluid flow using conservation of energy and conservation of momentum and understand its various application.
4	To evaluate laminar flow in pipes using various mathematical and empirical formulas

3CEU06: ADVANCED ENGINEERING MATHEMATICS

B.Tech. (Civil) 3rd semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Fourier Series & Z Transform –** Expansion of simple functions in fourier series. Half range series, Change of intervals, Harmonic analysis. Introduction, Properties, Inverse Z Transform.	**7**
II	**Laplace Transform -** Laplace transform with its simple properties. Unit step function, Dirac delta function their Laplace transforms, Inverse Laplace, transform – convolution theorem, applications to the solution of ordinary and partial differential equations having constant coefficients with special reference to wave and diffusion equations.	**8**
III	**Fourier Transform -** Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.	**8**
IV	**Numerical Analysis:** Difference operation Forward backward and central, shift and average operators and relation between them. Newton's forward and backward differences interpolation formulae. Sterling's formulae, Lagrange's interpolation formula. Numerical differentiation and integration. Trapezoidal rule, Simpson's one third and one eighth rule.	**9**
V	**Numerical integration**: Numerical integration of ordinary differential	**8**

	equations of first order, Picards method, Euler's method & Modified Euler's Method, Mille's method and Ranga Kutta fourth order method.		
		TOTAL	**40**

REFERENCE BOOKS

1. Engineering Maths Vol-I and II by Chandrika Prasad, Standard Publishers and Distributers.
2. Higher Engineering Maths by Gaur & Kaul, Jaipur Publishing House.

COURSE OUTCOMES	
1	Students will be able to learn and understand the concepts of Fourier Series and Z Transform
2	Students will be able to learn and understand the concepts of Laplace Transform
3	Students will be able to learn and understand the concepts of Fourier Transform
4	Students will be able to learn and understand the concepts of various methods of numerical analysis.
5	Students will be able to learn and understand the concepts of various methods of numerical integration.

3CEU07: CIVIL ENGINEERING MATERIAL LAB

1. Identification of Materials by Visual Inspection
2. To determine Normal Consistency, Initial & Final setting time, Specific Gravity, fineness & compressive strength of Cement (IS: 269-1967)
3. To Study the Utilization of Fly Ash
4. To Study the Procedure for Testing of Stone
5. To Study the Fiber Reinforced Concrete
6. To Study the Properties and Use of Different Glasses
7. To Study the Different Aluminum and Steel Sections
8. To Study the Manufacture and Use of Concrete Hollow Blocks
9. To Determine Compressive and Tensile Strength of Timber Parallel and Perpendicular to Grain
10. To Study the Properties and Uses of Kota Stone
11. To determine the Water Absorption and Tolerance Limit of Bricks

COURSE OUTCOMES	
1	Students will be able to identify the different materials by visual inspection only to find compressive and tensile strength of timber parallel to grain and perpendicular to grain. They will know about different type of steel and aluminium sections available and use of them.

3CEU08: ENGINEERING GEOLOGY LAB

1. Physical Properties of Minerals
2. Physical Properties of Rocks
3. Identification of Minerals in Hand Specimen
4. Identification of Rocks in Hand Specimen
5. Identification of Geological features through wooden Models
a) Structural Geological Diagrams
b) Petrological Diagrams
c) Engineering Geological Diagrams
6. Interpretation of Geological Map (10 Nos.)
7. Dip & Strike Problems (8 Nos.)

COURSE OUTCOMES	
1	To find out types & strength of Minerals & Rocks.
2	To find out types & strength of Rocks.
3	Site Selection of any engineering projects
4	To determine slope of highways.

3CEU09: BUILDING DRAWING – I

Building Components –
1. Drawing of walls
i. Brick and Stone masonry
ii. Partition wall, cavity wall and cross section of external wall
2. Pointing, Arches, Lintels and Floors
3. Doors and Windows
4. Stairs, Cross section of Dog legged stairs
5. Roofs: Flat and Inclined (Steel)
6. Foundations for Masonry Structures and Framed Structures, Provision of Damp Proof Course

Building Planning –
1. Development of Front Elevation and Sectional Elevation from a given plan
2. Development of Plan, Front Elevation and Sectional Elevation from line diagram

COURSE OUTCOMES	
1	After completion of this course, student will be able draw various building plans, and able to understand the plans for construction site.

3CEU10: FLUID MECHANICS LAB

1. To verify the Bernoulli's theorem.
2. To calibrate the Venturimeter.
3. To calibrate the Orificmeter.
4. To determine Metacentrie Height.
5. To determine Cc, Cv, Cd of an orifice.
6. To determine Cd of a mouthpiece.
7. To determine Cd of a V-notch.
8. To determine viscosity of a given fluid.
9. Bye pass.

COURSE OUTCOMES	
1	Through performing different experiments in laboratory, students will reinforce the theoretical concepts.

3CEU11: MORAL VALUES, PROFESSIONAL ETHICS AND DISASTER MANAGEMENT

COURSE OUTCOMES	
1	By learning and appreciating the human values and ethical aspects, we could produce better engineers who were more useful in delivering the goods in efficient manners. They could realize their importance in mitigating the various types of disasters.

4CEU01: STRENGTH OF MATERIALS – II

B.Tech. (Civil) 4th semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to objective, scope and outcome of the subject	1
I	**Deflection of Beams:** Differential relation between load, shear force, bending moment, slope deflection.	3
	Slope & deflection in determinate beams using double integration method, Macaulay's method, area moment method and conjugate beam method.	4
II	Analysis of prop cantilever structures, Analysis of Indeterminate Structure using Area moment method, Conjugate beam method Combined direct and bending stress, middle third rule, core of a section, gravity retaining wall	8
III	**Fixed Beams & Continuous Beams:** Analysis of fixed beams & continuous beams by three moments Theorem and Area moment method.	7
IV	**Torsion:** Elementary concepts of torsion, shear stress in solid and hollow circular shafts, angle of twist, power transmitted by a shaft, combined bending and torsion;	4
	Springs: Stiffness of springs, springs in series and parallel, laminated plate springs, leaf spring, close coiled helical springs, open coiled springs.	4
V	**Vibrations:** Elementary concepts of structural vibration, Mathematical models, basic elements of vibratory system. Degree of freedom. Equivalent Spring stiffness of springs in parallel and in series.	3
	Simple Harmonic Motion: vector representation, characteristic, addition of harmonic motions, Angular oscillation.	2
	Undamped free vibration of SDOF system: Newton's law of motion, D'Almbert's principle, deriving equation of motions, solution of differential equation of motion, frequency & period of vibration, amplitude of motion; Introduction to damped and forced vibration.	4
	TOTAL	40

Text Book: 1. Strength of Materials & Mechanics of Structures: Vol. I by Dr. B.C. Punmia Laxmi Publications (P) Ltd.

REFERENCE BOOKS

1. Strength of Material by Singer and Pytel, Harper Collins Publishers.
2. Elements of Strength of Materials by Timoshenko & Young, Mc Graw Hill Book Co.
3. Mechanics of Structures by Timoshenko & Gere, CBS Publishers and Distributers.
4. Mechanics of Structures Vol. I & II by S.B Junarkar, Charotar Publishing House.

COURSE OUTCOMES	
1	Student will be able to find deflection of any beam due given loading and use of different methods for different type determinate beams.
2	Students will be able to find design parameters of prop. Cantilever beam like max. S.F. & max. B.M. and can find the combined effect of direct & bending stresses and will be able to know retaining wall, forces.
3	Students will be able to analysis the fixed beam and continuous beam and able to draw S.F.D

	& B.M.D.	
4	Students will be able to find the effect of stresses produced due to torsion on hollow & solid circular shafts, also combined effects of bending & torsion shafts, use of different type of spring for purpose on the basic of their properties.	
5	Students will be able to understand the concept of vibration in structures, different degrees of freedom of structures, addition of harmonic motion, finding solution of differential equation of motions, frequency& period of vibration, effects of damping, free & force vibrations.	

4CEU02: CONCRETE TECHNOLOGY

B.Tech. (Civil) 4ᵗʰ semester   **Max. Marks: 100**
                                                     Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to objective, scope and outcome of the subject	1
I	**Ingredients of concrete:** Cement: hydration of cement and its basic compounds, structure of hydrated cement, C-S-H gel, heat of hydration, gel-space ratio and its significance. **Aggregates:** types, physical properties and standard methods for their determination.	3
	Concrete : Grade of concrete, proportioning of ingredients, water content and its quality for concrete, water/cement ratio and its role, Properties of fresh concrete including workability, air content, Flow ability, Segregation, Bleeding and Viscosity etc. - Factors affecting, methods of determination.	4
II	Properties of hardened concrete such as strengths, permeability, creep, shrinkage, factors influencing, Standard tests on fresh and hardened concrete as per IS code. Aggregate- cement interface, maturity concept.	4
	NDT: Introduction and their importance. Application & use of Rebound Hammer, Ultra-sonic pulse velocity meter, Rebar & Cover meter, half cell potential meter, corrosion resistivity meter, core sampling.	4
III	**Concrete Handling in Field:** Batching, mixing, placing and transportation of concrete, equipments for material handling, various methods their suitability and precautions. Compaction of concrete: methods & equipments. Curing of concrete: various methods their suitability. Durability of concrete.	7
IV	Concrete mix deign (ACI, IS method), quality control for concrete.	3
	Admixture in concrete: Chemical and mineral admixtures, their types and uses: water reducers, accelerator, retarders, water-proofing plasticizers, super plasticizers, air-entraining agents. Use of fly ash and silica fume in concrete, their properties and effect.	6
V	**Form work:** Requirements, their types and codal guidelines for the design. Typical formworks and shuttering/centering for Columns, beams, slabs, walls, arches and staircase. Slip and moving formwork.	4
	Special types of concrete: Introduction to high strength concrete, high performance concrete, sulphate resisting concrete, under water concreting, self compacting concrete, pumpable concrete: their salient properties and application.	4
	TOTAL	**40**

TEXT BOOK:
1. Concrete Technology by Neville & Brooks, Pearson Education.

REFERENCE BOOKS

1. Concrete: Microstructure, Properties & Materials by Mehta P.K, Tata Mc Graw Hill.
2. Concrete Technology by M.S.Shetty, S.Chand & Co.
3. Concrete materials by Popovics, Standard Publishers.
4. Chemistry of Cement and Concrete by Peter C.Hewlett, Elsevier Butterworth Heinemann.

COURSE OUTCOMES	
1	Students will be able to learn about cement hydration and associated applications.
2	Students will be able to know basic concepts of concrete making and properties of components and IS related specifications.
3	Students will be able to know properties of concrete in fresh and hardened states and factors affecting them.
4	Students will be able to design concrete mix as per IS method.
5	Students will be able to know about different types of form work and special concretes, their properties and applications.

4CEU03: HYDRAULICS AND HYDRAULIC MACHINES

B.Tech. (Civil) 4ᵗʰ semester   **Max. Marks: 100**

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to scope, objective and outcome of subject**	**1**
I	**Dimensional Analysis & Models:** Dynamical Similarity and Dimensional Homogeneity Model experiment, geometric, Kinematic and Dynamic similarity. Reynold's, froudes, Weber's, Euler and Mach numbers. Distorted river models and undistorted models, proper choice of scale ratios. Scale effect.	**3**
	Principle of dimensional analysis Rayleigh method, Buckingham theorem, applications of dimensional analysis to pipe Friction problems, resistance to motion of partially and fully submerged bodies and other simple problems. Ship model experiments.	**4**
II	**Laminar Flow:** Relation between shear & pressure gradient. Flow between plates & pipes. Equations for velocity distribution, pressure difference.	**3**
	Turbulent Flow in pipes: Theories of Turbulence, Nikuradse's Experiments. Hydro dynamically smooth & rough boundaries. Laminar, Sub layer, Equations of velocity distribution and friction coefficient. Stanton Diagram, Moody's diagram.	**5**
III	**Flow through channels:** Uniform, Non-Uniform and variable flow. Resistance equations of Chezy, Mannring and Bazin. Section factor for uniform flow. Most Efficient rectangular, triangular and trapezoidal sections.	**3**
	Equations of gradually varied flow in Prismatic channels. Limitation of its applicability and assumption made in its derivation. Specific energy of flow. Critical depth in prismatic channels. Alternate depths. Rapid, critical and sub critical Flow Mild, steep and Critical Slopes. Classification of surface curves in prismatic channels and elementary computation	**5**

UNIT	CONTENTS	CONTACT HOURS
IV	**Rapidly varied flow**: Hydraulic jump or standing wave in rectangular channels. Conjugate or sequent depths Losses in jump, location of jump. Broad crested weirs for channel flow: Measurement, velocity distribution in open channels, parshall flume.	5
	Impact of free Jets: Impact of a jet on a flat or a curved vane, moving and stationary vane, flow over radial vanes.	3
V	**Centrifugal pumps and turbines:** Volute and whirlpool chambers, Loses of head due to variation of discharge Manometric and Hydraulic efficiencies, Description of single and multistage pumps. Specific speed, characteristic curves. Model Test. Reaction and Impulse turbines, specific speed, Mixed flow turbines. Pelton wheel turbine, Francis turbine, propeller turbine and Kaplan turbine Efficiency, Characteristics of turbines. Basic principles of governing of turbines, Draft-tube, Selection of turbines, model tests.	8
	TOTAL	40

Text Book:

1.Fluid Mechanics & Hydraulics by Dr. K.R, Arora, Standard Publishers & Distributers, Delhi.

REFERENCE BOOKS

1. Fluid Mechanics & Hydraulics by John F.Douglas & Lynne B. Jack, Prentice Hall Inc.
2.Fluid Mechanics & Hydraulics by Dr. R.K. Bansal, Laxmi Publications (P) Ltd.
3.Fluid Mechanics & Hydraulics by Modi & Seth, Standard Publishers & Distributers, Delhi.
4. Fluid Mechanics & Machinery by C.S.P.Ojha, R.Berndtsson and P.N.Chandramauli, Oxford Publishers, Delhi.

COURSE OUTCOMES	
1	To analyse physical and mathematical model using various principles and method.
2	To understand laminar and turbulent flow in pipe and plates.
3	To apply various principles and theorem in uniform open channel flow and Rapid varied flow
4	To understand the impact of free jets and compare various types of pumps and turbine

4CEU04: SURVEYING – I

B.Tech. (Civil) 4ᵗʰ semester   **Max. Marks: 100**
                                                                Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject	1
I	**Introduction: Importance** of surveying to engineers, Plane and geodetic surveying, methods of location of points, principle of surveying from whole to part, conventional signs.	3
	Measurement of Distances: Different types of chains, tapes and their uses. Sources of error and precautions, corrections to tape measurements. Field problems in distance measurement. Advance techniques of distance measurements.	4

UNIT	CONTENTS	CONTACT HOURS
II	**Measurement of Angles & Direction:** Different types of direction measuring instruments and their uses. Reference meridians, Bearing and azimuths, magnetic declination and its variation. Use and adjustment of surveyors and prismatic compass.	4
	Vernier and micro-optic theodolite, temporary and permanent adjustment of vernier theodolite. Measurement of horizontal and vertical angle by different methods. Application of theodolite in field problems.	4
III	**Traversing:** Different methods of traversing; chain traverse, chain & compass traverse, transit-tape traverse. Methods of computations and adjustment of traverse; transit rule, Bowditch rule, graphical method, axis method. Gales traverse table.	8
IV	**Leveling:** Definitions of various terms in leveling. Different types of leveling, sources of errors in leveling curvature and refraction corrections. Temporary and permanent adjustment of dumpy and tilting levels. Computation and adjustment of levels. Profile leveling; L-Section and cross-sections.	8
	Plane Table Surveying: Elements of plane table survey working operations, methods of plane table survey; intersection, traversing and resection, two point and three point problems.	4
V	**Contouring:** Characteristics of contours, contour interval, contour gradient, Methods of locating contours, uses of contour maps.	4
	TOTAL	**40**

TEXT BOOK:

1. Surveying Volume I by Dr. B.C. Punamia Laxmi Publications (P) Ltd.

REFERENCE BOOKS

1. Plane Surveying by Dr. A.M. Chandra, New Age International.
2. Surveying Volume –I & II by Dr. K.R. Arora Standard Book House Delhi
3. Surveying & Leveling by Subramanian Oxford University Press.
4. Surveying Vol.1 by S.K.Duggal Tata Mc Graw Hill,Delhi.

COURSE OUTCOMES	
1	Students will learn about tape, chain and other equipment through field exercise.
2	Students will learn about different devices such as prismatic, surveyor compass, etc.
3	Students will learn about different rules and methods for traverse computation.
4	Students will learn about collection of data with the help of equipments and their calculation.
5	Students will get elementary ideas about plane-table, surveying and its applications in field.

4CEU05: BUILDING PLANNING

B.Tech. (Civil) 4th semester   **Max. Marks: 100**
                                                                         Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject	1
I	**Introduction**: Types of buildings, Classification of buildings by occupancy, Multi storey building, criteria for location and site selection, site plan and its	3

	detail.	
	Sun Consideration : Different methods of drawing sun chart, sun shading devices, design of louvers, energy conservation in buildings, passive solar cooling and heating of buildings.	**4**
II	**Climatic and comfort Consideration**: Elements of climate, global climate, climatic zones of India, comfort conditions, biclimatic chart, climate modulating devices.	**3**
	Orientation: Meaning, factors affecting orientation, orientation criteria for tropical climate.	**2**
	Building Bye Laws and NBC Regulations: Objective of by-laws, Regulation regarding; means of access, lines of building frontages, covered area, floor area ratio, open spaces around buildings, height & sizes of rooms, plinth regulation and sanitation provisions.	**4**
III	**Principles of Planning:** Different factors affecting planning viz-aspect, prospect, furniture requirement, roominess, grouping, circulation, elegance, privacy etc.	**5**
	Vastu Shastra In Modern Building planning: Factors considered in Vastu, site selection, orientation, planning and design of residential buildings, office buildings.	**2**
IV	**Functional design and Accommodation requirements of** (A) **Residential Buildings:** Anthrometry, activities and their spatial requirements; Area planning, living area, sleeping area, service area; Bubble diagram showing sequence of arrangement of area, plan, elevation, sectional elevation.	**4**
	(B) **Non Residential Buildings:** viz-school buildings, rest house, primary health centers, post office, bank, College library, cinema theatres etc.	**4**
V	**Services in Buildings** (A) Lighting and ventilation, doors and windows, lifts. (B) Acoustics, sound insulation and noise control. (C) Fire fighting provisions.	**8**
	TOTAL	**40**

REFERENCE BOOKS

1- Manual of Tropical Housing and Buildings by Koenigs Berger Orient and Longman.

2- Building Drawing by M.G.Shah, C.M. Kala, S.Y.Patki , Tata Mc Graw Hills.

3. SP.41 (S&T)- Handbook on functional Requirements of Buildings Part-I

4. National Building Code, BIS.

5. Architecture Drafting and Design by Donald E. Helper, & Paul I Wallach.

6. Time Saver Standards for Housing and Residential Development by DE Chiara, Tata Mc Graw Hill, Delhi.

	COURSE OUTCOMES
1	Students will have practical knowledge about site selection, function of building
2	Students will be able to learn about functional design of building
3	Students will be able to learn for ensuring safety of user through open spaces, height/size of rooms etc.
4	Students will be able to learn about design of different types of building
5	Students will be able to learn about different requirements of users in terms of water supply, sanitation, electrical fitting.

4CE6A: QUANTITY SURVEYING AND VALUATION

B.Tech. (Civil) 4th semester   **Max. Marks: 100**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject	1
I	**Introduction:** Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.	8
II	**Rate Analysis:** Task for average artisan, various factors involved in the rate of an item, material and labor requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)	8
III	**Estimates:** Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts, Services for building such as water supply, drainage and electrification.	10
IV	**Cost of Works:** Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building.	5
V	**Valuation:** Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings**.**	8
	TOTAL	40

Text Book:
1- Estimating & costing by B.N.Dutta, UBS Publishers & Distributers.

REFERENCE BOOKS
1. Estimating Costing Specification & Valuation in Civil Engg. M .Chakroborty, Bhakti Vedanta, Book Trust, delhi.
2. Quantity Surveying and Valuation by S.C. Rangawala , Charotar Publishing House.

COURSE OUTCOMES	
1	Students will be able to know the purpose and importance of estimates, types of estimates.
2	Students will be able to prepare rate analysis of different works and apply their knowledge in field.
3	Students will learn to prepare various estimates in field.
4	Students will be able to know about the factors affecting cost of work and other technical terms so that they are acquainted with them during their employment in industry.
5	Students will be able to prepare valuation of properties, buildings and it will help them in their field job.

4CEU07: CONCRETE TECHNOLOGY LAB

1. To determine the fineness of Cement by sieving through a 90 micron I.S. Sieve.
2. To determine the flexural strength of Concrete.
3. To determine Soundness of cement by Le-chatelier apparatus.
4. To determine the specific gravity of fine aggregate (sand) by Pycnometer.
5. To determine the bulking of fine aggregate and to draw curve between water content and

bulking.

6. To determine the fineness modulus of coarse aggregates and fine aggregates by sieve analysis.
7. To determine the workability of given concrete mix by slump test.
8. To determine the workability o given fresh concrete mix by compaction factor test.
9. To determine the optimum dose of super plastsizers by by Flow table test.
10. To design concrete mix of M-20 grade without admixture in accordance with IS recommendations.
11. To design concrete mix of M-40 grade with admixture in accordance with I S recommendations.
12. To determine the Elstic Modulus of Concrete.
13. To determine the Permeability of Conerte.
14. NDT

COURSE OUTCOMES	
1	Students will be able to know and learn testing procedure for aggregates.
2	Students will be able to know and learn testing of fineness of cement and its soundness.
3	Students will be able to know and learn through hands on experience for tests on fresh and hardened properties of concrete.
4	Students will be able to know about NDT and test procedure to use super plasticizer.
5	Students will be able to make concrete through designing and making it themselves.

4CEU08: HYDRAULICS AND HYDRAULIC MACHINES LAB

COURSE OBJECTIVES	
1	To demonstrate determination minor losses in pipes bent enlargement, contraction. To demonstrate determination of friction failure.
2	To demonstrate determination of constant Cd of broad crested weir and verification of momentum equation.
3	To determine discharge in venturimeter. To demonstrate determination of manning's and Chezy's coefficient of roughness of bed of flume.
4	To demonstrate determination of characteristics curve or hydraulic jump. Determination of characteristics curves or peloton wheel.
5	To demonstrate determination of characteristics curve of centrifugal pump.

4CE8A: HYDRAULICS LAB. (P-2)

1. To determine the minor losses.
2. To determine the friction factor.
3. To determine C_d of Broad crested wier.
4. To verify the momentum equation.
5. To determine the discharge of venturimeter.
6. To determine Manning's & Chezy's coefficient of roughness for the bed of a given flume.
7. To plot characteristics curve of hydraulic jump.
8. To plot characteristics curve of Pelton Wheel.
9. To plot characteristics curve of Centrifugal Pump.

COURSE OUTCOMES	
1	Students will be able to determine minor losses in pipes bent enlargement, contraction and friction failure.
2	Students will be able to determine constant Cd of broad crested weir and verification of

	momentum equation.
3	Students will be able to determine discharge in venturimeter and manning's and Chezy's coefficient of roughness of bed of flume.
4	Students will be able to determine characteristics curve or hydraulic jump and characteristics curves or peloton wheel.
5	Students will be able to determine characteristics curve of centrifugal pump.

4CEU09: SURVEYING LAB – I

1. Ranging and Fixing of Survey Station.
2. Plotting Building Block by offset with the help of cross staff.
3. To determine the magnetic bearing of a line
a. Using surveyor's compass
b. Using prismatic compass
4. Measurement and adjustment of included angles of traverse using prismatic compass.
5. To determine the reduced levels using Tilting Level/Automatic Level.
6. To determine the reduce levels in closed circuit using Dumpy Level.
7. To carry out profile leveling and plot longitudinal and cross sections for road.
8. To carryout temporary adjustment of Theodolite & Measurement of horizontal angle.
a. By method of repetition.
b. By method of Reiteration.
10. To determine the tachometric constant.
11. To determine the horizontal and vertical distance by tachometric survey.
12. To study the various minor instruments.

COURSE OUTCOMES	
1	Students will be able to apply the concept of surveying and leveling in field exercises and have a feel of its applications.

4CEU10: BUILDING DRAWING – II

1- To plan and draw working drawing of a Residential building with following detail.
(a) Site plan
(b) Foundation plan
(c) Plan
(d) Two sectional elevations
(e) Front elevation
(f) Furniture plan
(g) Water supply and sanitary plan
(h) Electric fitting plan
2- To design and draw a Primary Health Center
3- To design and draw a Primary School
4- To design and draw a Rest House
5- To design and draw a Post Office
6- To design and draw a Bank
7- To design and draw a College Library
8- To design and draw a Cinema Theatre

COURSE OUTCOMES	
1	Students will be able to learn about, dimensions, types of walls/ foundations
2	Students will be able to learn about types and uses of different types of floors/ roofs etc.
3	Students will be able to learn about how to draw different types of stairs

4	Students will be able to learn about how to draw plan/section of different types of doors/ windows
5	Students will be able to learn how to draw drawings of different types of buildings

4CEU11: MATERIAL TESTING LAB

1. Tensile Strength Test – Mild Steel and HYSD bar
2. Compressive Strength Test – Mild Steel and Cast Iron
3. Compressive Strength Test – Cement Cubes and Concrete Cubes
4. Compressive Strength Test – Bricks
5. Compressive Strength Test – Wooden Blocks
6. Hardness Test – Rockwell Hardness and Brinell Hardness
7. Impact Test – Izod and Charpy
8. Modulus of Rupture of Wooden Beam
9. Fatigue Test
10. Spring Test
11. Torsion Test

COURSE OUTCOMES	
1	Students will be able to use the material judiciously by knowing the engineering properties of various materials.

5CEU01: THEORY OF STRUCTURES – I

B.Tech. (Civil) 5th semester　　　　　　　　　　**Max. Marks: 100**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject.	1
I	Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem, Analysis of Statically Indeterminate Structures using Slope-deflection method.	8
II	Analysis of structures using Moment-distribution method applied to continuous beams and portal frames with and without inclined members	7
III	Unit load method & their applications: deflection of determinate beams and frames, analysis of determinate and redundant frames up to two degree of redundancy, lack of fit in redundant frames.	4
III	Introduction to Energy Methods: Strain energy for gradually applied, suddenly applied and impact loads, Strain energy due to axial loads, bending, shear and torsion;. Castiglione's theorems & their applications in analysis of determinate and redundant frames up to two degree of redundancy and trussed beams; Stresses due to temperature & lack of fit in redundant frames; deflection of determinate beams, frames using energy methods	6

UNIT	CONTENTS	CONTACT HOURS
IV	Column Analogy method for indeterminate structures, determination of carry over factor for non-prismatic section. Kani's Method: Analysis of beams and frames with & without sway by Kani's method.	7
V	Approximate methods for lateral loads: Analysis of multistory frames by portal method, cantilever method & factor method. Analysis of determinate space trusses by tension coefficient method.	7
	TOTAL	**40**

Text Book:

1. Strength of Materials & Mechanics of Structures: Vol. I by Dr. B.C. Punmia Laxmi Publications (P) Ltd.

REFERENCE BOOKS

1. Advanced Structural Analysis by Dr. A.K. Jain, Nem Cahnd and Brothers, Roorkee.
2- Mechanics of Structures by Timoshenko & Young, Mc Graw Hill Book Co.
3- Mechanics of Structures Vol.-I by Junarkar & Shah, Charotar Publishing House.
4- Theory of Structures by Jangid & Negi, Tata Mc Graw Hill.
5- Structural Analysis by Ghali & Neville, E&FN,Spon.
6.Structural Analysis by Hibbler R.C., Pearsons

COURSE OUTCOMES	
1	Student will be able to find out static and kinematic indeterminacy. Student will be able to learn slope deflection method with and without sway of portal.
2	Student will be able to learn MDM for beam and frames with and without sway.
3	Student will be able to learn column analogy method for beam and portal frame. Also they will be able to find carry over factor, by column analogy method. Student will be able to solve structure by Kani's methods.
4	Student will be able to find out deflection in beam and frames. They will be able to find out redundant force in redundant frames.
5	Student will be able to solve the frame for lateral load analysis by portal method, cantilever method and portal method. Student will be able to learn the structure by tension coefficient method to solve 2D and 3D structure.

5CEU02: ENVIRONMENTAL ENGINEERING – I

B.Tech. (Civil) 5th semester   **Max. Marks: 100**
                                                                      Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject.	1
I	**General:** Environment and its components, Importance of water, Role of an Environmental Engineer, Historical overview.	2

	Water Demand: Design flow, design periods, design population, factors affecting water consumption, variation in water demand, design capacities for various water supply components.	**5**
II	**Source of water and collection works:** Alternative sources i.e. rain, surface and ground water, Assessment of yield and development of the source.	**4**
	Quality of water: The hydrological cycle and water quality, physical, chemical and biological water quality parameters, water quality requirements, Indian Standards.	**4**
III	**Transmission of water:** Hydraulics of conduits, selection of pipe materials, pipe joints, pumps, pumps station.	**3**
	Preliminary Treatment of Water: Historical overview of water treatment, water treatment processes (theory and application): aeration, solids separation, settling operations, coagulation, softening,	**5**
IV	**Advanced Treatment of Water:** filtration, disinfection, other treatment processes, dissolved solids removal, treatment plant design, preparation of hydraulic profiles.	**8**
V	**Distribution of water:** Method of distributing water, distribution reservoirs, distribution system, distribution system components, capacity and pressure requirements, design of distribution systems, hydraulic analysis of distribution systems, pumping required for water supply system.	**5**
	Plumbing of Building for water supply: Service connections, fixture units, simultaneous flow, design of plumbing system.	**3**
	TOTAL	**40**

TEXT BOOK:

1- Water Supply by S.K. Garg, Khanna Publishing Co.

REFERENCE BOOKS

1. Environmental Engineering by Peavy, H.S., Rowe D.R. and Techobanoglous, Mc Graw Hill, Book Company.
2. Manual of Water Supply and Water Treatment, Ministry of Urban Development, Govt.of India.

COURSE OUTCOMES	
1	Recognizing about environment, understanding his role as an engineer and evaluate the quantity of water required for various intended purposes.
2	Evaluating about various sources of water for daily use and then examine quality parameters for the intended usage.
3	Plan various treatment processes viz. sedimentation, coagulation, filtration etc. and their design aspects.
4	Evaluate about transmission systems, planning distribution network and develop the hydraulic profile(s) accordingly.

5CEU03: GEOTECHNICAL ENGINEERING – I

B.Tech. (Civil) 5th semester   **Max. Marks: 100**

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject.	1
I	Soil and soil-mass constituents, water content, specific gravity, void ratio, porosity, degree of saturation, air void and air content, unit weights, density index etc. Inter-relationships of the above. Determination of index properties of soil: water content, specific gravity, particle size distribution, sieve and sedimentation analysis, consistency limits, void ratio and density index. Classification of soil for general engineering purposes: particle size, textural, H.R.B. Unified and I.S. Classification systems.	8
II	Clay mineralogy: Soil structure; single grained, honeycombed, flocculent, and dispersed, structure of composite soils, clay structure; basic structure, mineral structures, structures of Illite Montmorilinite and kaolinite and their characteristics.	4
	Soil water absorbed, capillary and free water, Darcy's law of permeability of soil and its determination in laboratory. Field pumping out tests, factors affecting permeability, permeability of stratified soil masses.	4
III	Stresses in soil mass: total, effective and neutral pressure, calculation of stresses, influence of water table on effective stress, quicksand phenomenon	3
	Seepage and Seepage Pressure, Laplace's equation for seepage. Flow net and its construction. Uplift pressure, piping, principle of drainage by electro Osmosis, phreatic line, Flow net through earth dam.	5
IV	Mohr's circle of stress, shearing strength of soil, parameters of shear strength, Coulomb's failure envelope, determination of shear parameters by Direct Shear Box. Triaxial and unconfined compression test apparatuses. Typical stress-stain curves for soils. Typical failure envelopes for cohesion less soils and normally consolidated clay soils.	8
V	Principles of soil compaction, laboratory compaction tests; Proctor's test Modified Proctor tests, Measurement of field compaction, field methods of compaction and its control, dry and wet of optimum, factors affecting compaction, compaction equipments. Soil stabilization, Mechanical Stabilization. Stabilization with cement, lime and bitumen.	8
	TOTAL	**40**

Text Book:

1- Basic and applied Civil Mechanics by Rajan & Rao, New Age International Publishers.

REFERENCE BOOKS

1. Soil Mechanics & Foundation Engineering by Arora K.R, Standard Publishers and Distributers, Delhi.
2. Soil Engineering in Theory & Practice by Alam Singh, CBS Publishers and Distributers, Delhi.

COURSE OUTCOMES	
1	The student shall be able to identify and classify the soil, can determine its properties in the lab. They shall be able to under clay mineralogy and its behaviour in the presence of water. The permeability and seepage analysis of soil, compaction properties and their determination shall be known to the students. They shall be able to supervise the compaction of sub grade embankments etc. The strength of soil against shear shall be known to the student.

5CEU04: SURVEYING – II

B.Tech. (Civil) 5ᵗʰ semester **Max. Marks: 100**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject.	1
I	**Trigonometric Leveling:** Trigonometric leveling, Objects accessible and non accessible, Determination of levels object- when two instrument positions in same and different vertical planes**.**	3
	Curvature, Refraction and **A**xis Signal corrections, Determination of difference in elevations of points by trigonometric leveling by single observation method (angle of elevation, angle of depression), reciprocal method.	4
II	**Curve Surveying:** Elements of circular (Simple, compound and reverse) curves, transition curves, degrees of curve, Linear and angular Methods of setting out circular and transition curves.	8
III	**Triangulation:** Merits and demerits of traversing, triangulation and trilateration. Grades of triangulation, Strength of figure, field procedure of triangulation. Reconnaissance and selection of triangulation stations.	
	Indivisibility of stations and calculation of the heights of towers. Equipment needed for base line measurement, corrections to base line. Satellite station and base line extension.	8
IV	**Errors in Surveying:** Classification of errors in surveying. The probability curve, its equation and properties, theory of least squares, weight, most probable valve, probable errors, standard errors. Normal equation correlates.	4
	Adjustment of Triangulation Figures: Adjustment of levels. Adjustment of triangulations figures, Braced quadrilateral Triangle with central, station. Approximate and method of least squares for figure adjustment, Trilateration.	4
V	**Field Astronomy:** Definitions of terminology used in Astronomy, Co-ordinate Systems.	
	Relationships between different Co-ordinate systems. Astronomical Triangle, Napier's Rule. Different methods of determination of Azimuth. Electronic distance measurement and use of Total station.	8
	TOTAL	**40**

Text Book: 1-Surveying – Vol. I & II by K.R. Arora Satandard Book House,Delhi.

REFERENCE BOOKS:
1. Surveying Vol. 2 & 3 by B C Punmia Laxmi Publications, Delhi.
2. Advance Surveying by Sathees Kumar, R.Sathis Kumar , N. Madhu, Pearson Education
3. Plane and Geodetic Surveying Vol.I &II, BY David Clark, CBS Publishers and Distributers.
4. Surveying Vol.2 by S.K.Duggal, Tata Mc Graw Hill, Delhi.
5. Advance Surveying by A.M.Chandra, New Age Inetrnational, Delhi.

COURSE OUTCOMES	
1	After completion of this course, the students will be able to determine the levels of very high and distant object which otherwise could not be determined by simple leveling.
2	Students will be able to apply knowledge of curves in the projects of road, railway etc.
3	Students will be able to carry out triangulation survey and establish horizontal and vertical control points for important civil engineering projects.
4	Students will be able to make adjustment of triangulation figures.
5	Students will be able to make observations on heavenly bodies such as star, sun and will use concept to determine azimuth of lines, latitude and longitude of places.

5CEU05: BUILDING DESIGN

B.Tech. (Civil) 5th semester   **Max. Marks: 100**
                                                      Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject.	1
I	**Design Loads:** Design loads for different types of buildings. (IS-875 part 1 & 2). Load distribution & concept of load flow to different structural components.	3
	Structural Systems: Assumption of integrity aspect ratios & over turning resistance, strength & stiffness of buildings, symmetry and Asymmetry in building forms, Vertical and lateral load resting elements, shear walls, framed tubes and various multistory configurations.	4
II	**Lateral loads:** Wind loads & calculation of wind load on structures (IS: 875-Part 3).	8
III	**Lateral loads:** Earthquake loads & calculations of earthquake loads on buildings masonry & framed structures. (IS: 1893 – Part 1).	8
IV	**Masonry and Framed Buildings:** Design of masonry buildings and framed buildings, Earthquake resistant construction of buildings, and various provisions as per IS codes; IS-4326, IS-13827, IS-13828, IS-13920, IS-13935.	8
V	**Mass Housing:** Prefabricated construction for mass housing. **Special Roofs:** Introduction to folded plates, cylindrical shells, north-light shell roofs, grid and ribbed floors.	8
	TOTAL	40

REFERENCE BOOKS

IS : 875, Part I, II & III
IS : 1893
IS : 4326
IS : 13920

COURSE OUTCOMES	
1	Students will be able to understand design loads for different types of building. (IS 875 part 1&2) & Structural systems like Overturning resistance, Shear wall, Various multistory configurations.
2	Students will be able to understand to apply the IS: 875 Part -3 for calculation of wind load on structures.
3	Students will be able to understand the earthquake load and calculation of earthquake load on masonry and framed structures.
4	Students will be able to understand the designs of masonry and framed buildings, Earthquake resistant construction and apply IS-4326, IS-13827, IS-13828, IS-13920, and IS-13935.
5	Students will be able to understand about Pre Fabrication for mass housing and special roofs as folded plates, Cylindrical shell, Beam theory, North light shell roof and grid and ribbed floors.

5CEU6.1: GROUND IMPROVEMENT TECHNIQUES

B.Tech. (Civil) 5th semester　　　　　　　　　　　　　**Max. Marks: 100**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
	Introduction to scope, objective and outcome of subject.	1
I	**Introduction:** Formation of soil, major soil types, collapsible soil, expansive soil, reclaimed soil, sanitary land fill, ground improvements; objective, potential.	4
	General principles of compaction: Mechanics, field procedure, quality control in field.	3
II	**Ground Improvement in Granular soil:** In-place densification by (a) Vibro floatation (b) Compaction piles in sand(c) Vibro compaction piles (d)Dynamic compaction (e) Blasting	8
III	**Ground improvement in cohesive soil:** Preloading with or without vertical drains. Compressibility vertical and radial consolidation, Rate of consolidation, Preloading methods. Types of drains, Design of vertical drains, Construction techniques.	5
	Stone column: Function, Design principles, load carrying capacity, construction techniques, settlement of stone column foundation.	3
IV	**Ground Improvement by Grouting & Soil Reinforcement:** Grouting in soil: Types of grout, desirable characteristics, Grouting pressure, Grouting methods.	4
	Soil Reinforcement – Mechanism, Types of reinforcing elements, Reinforcement- Soil interaction, Reinforced soil application beneath roads, foundation and retaining walls.	4
V	**Soil Stabilization:** **Lime Stabilization** – Base Exchange mechanism, Pozzolonic reaction, lime-soil interaction, lime columns, Design of foundation on lime column. **Cement stabilization**-Mechanism, amount, Age and curing. **Fly ash-Lime stabilization** **Soil bitumen stabilization**	8
	TOTAL	40

Text Book:

1- Ground Improvement Techniques   by Purushottam Raj, Tata Mc Graw Hills, Delhi.
REFERENCE BOOKS

1. Text book of Geostatic Engineering by Gulhati & Dutta, Tata Mc Graw Hills, Delhi.
2. Principles of Foundation Engg by B.M. Das, Thomson, Books/Cole.
3. Foundation Design Manual By N.V Nayak, Dhanpat Rai and Sons.
4. Soil Engineering in Theory and Practice Vol. III by Alam Singh CBS Publishers

COURSE OUTCOMES	
1	At the end of course students will be able to sense different types of soil and apply suitable ground improvement techniques. They will be able to program the compaction project and control compaction the field.
2	Student will be able to design compaction pile, and can carry out construction of vibro piles. They can also carry out project of dynamic compaction of blasting
3	Students will be able to design stone column, can design preloading technique. They can be able to construct vertical drains and calculate three dimension consolidation settlements.
4	Student will be able to carry out the grouting projects. They will be able to design of construct reinforcement earth structures.
5	They will be able to apply suitable stabilization techniques to appropriate soil.

5CE7A: ENVIRONMENTAL ENGINEERING LAB – I

1. To determine the pH of the given sample of water.
2. To determine the turbidity of the given sample of water
3. To determine Total Solids of the given water sample.
4. To determine the Total Dissolved Solids of the given water sample.
5. To find out conductivity of the given water sample.
6. To determine hardness of the given water sample.
7. To find out chloride of the given water sample.
8. To determine alkalinity of the given water sample.
9. To find out acidity of the given water sample.
10. To determine hardness of the given water sample.
11. To determine the optimum dose of alum by Jar test.
12. To study various water supply Fittings.

COURSE OUTCOMES	
1	Students will be able to learn the determination of various physical and chemical parameters of water in the lab.

5CEU08: GEOTECHNICAL ENGINEERING LAB – I

1. Grain size distribution by Sieve Analysis
2. Determination of water content by Pycnometer.
3. Determination of specific Gravity by Pycnometer.
4. Determination of liquid limit by Casagrande's apparatus.
5. Determination of liquid limit by cone penetrometer.
6. Determination of plastic limit
7. Determination of shrinkage limit
8. Determination of field density by core-cutter
9. Determination of field density by sand replacement method
10. Determination of compaction properties by standard Proctor Test Apparatus

11. Determination of C-Ø values by Direct Shear Test Apparatus
12. Determination of Unconfined Compressive Strength by unconfined compression Test Apparatus

COURSE OUTCOMES	
1	The students shall be able to determine the various properties of soil in the lab, their interpretation and usefulness in field projects.

5CEU09: SURVEYING LAB – II

1. To measure the horizontal and vertical angles by Theodolite.
2. To determine the Height of an object by trigonometric leveling (Instruments in same vertical plane).
3. To determine the Height of an object by trigonometric leveling (Instruments in different vertical planes).
4. To shift the R.L. of known point by double leveling.
5. To measure and adjust the angles of a braced quadrilateral.
6. To prepare a contour map by indirect contouring.
7. To prepare the map of given area by plane tabling.
8. To determine the Azimuth of a given line by ex-meridian observations of Sun.
9. Survey Camp (including exercise on triangulation, topographic, or project survey) with maximum duration of 10 days.

COURSE OUTCOMES	
1	After completion of this course, the students will be competent to handle all kinds of survey problem such as leveling, topographical map preparation, triangulation survey, astronomical survey etc. They will also be competent in handling the instruments such as theodolite, level, total stations, plane table etc.

5CEU10: COMPUTER AIDED BUILDING DESIGN

Design Problems as syllabus of theory

COURSE OUTCOMES	
1	After completion of this course, students will be more confident and could learn the application of basic IS codes related to wind load and earthquake load. Students will be able to design of masonry and framed building. Also can do calculations for wind load & earthquake load. This understanding will help those getting jobs as design engineer and can do consultancy work related design work.

5CE11A: STRUCTURAL ENGINEERING LAB

1. Study of friction, screw jacks, winch crabs etc.
2. Deflection of a truss
3. Clark-Maxwell reciprocal theorem with truss
4. Funicular polygon for flexible cable
5. Analysis of redundant frame
6. Deflection of curved members
7. Buckling of columns
8. Clark-Maxwell reciprocal theorem with simply supported beam
9. ILD for deflection in a steel beam using unit load method

10. ILD for support reaction using Muller-Breslau Principle
11. Unsymmetrical bending.
12. **Two hinged and three hinged arches.**

COURSE OUTCOMES	
1	The students well be able to understand and apply the concept learned in laboratory to practical problem related to Unsymmetrical bending, ILD by unit load method, deflection of truss, deflection of curve member.

6CEU01: THEORY OF STRUCTURES – II

B.Tech. (Civil) 6th semester   **Max. Marks: 100**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Influence line diagram & Rolling load:** ILD for beams & frames, Muller-Breslau principle and its application for drawing ILD, Rolling load, maximum stress resultants in a member/section, absolute maximum stress resultant in a structure.	8
II	**Arches**: analysis of three hinged two hinged and fixed type parabolic arches with supports at the same level and at different levels.	8
III	**Cable and Suspension bridges**: Analysis of cables with concentrated and continuous loading, analysis of two & three hinged stiffening girder.	8
IV	**Unsymmetrical bending**: Definition, location of NA, computation of stresses and deflection, shear center and its location, Theories of Failures	8
V	Introduction to matrix method, Force displacement relation, flexibility and stiffness coefficients, relation between flexibility and stiffness matrices, system approach of flexibility method and stiffness method, coordinate transformation matrix, rotation matrix, element and global stiffness matrix for pin jointed structures and beam element in 2D only.	8
	TOTAL	**40**

REFERENCE BOOKS

1-Mechanics of Structures Vol. I & II by S.B. Junarkar & Shah, Charotar Publishing House.

2- Theory of Structures by B.C. Purnmia, Laxmi Publication (P) Ltd.

3- Theory of Structures by Timoshenko, Mc Graw Hill Book Co.

4- Structural Analysis by Ghali & Neville, E&FN Spon.

5. Structural Analysis by Hibbler R.C., Pearsons

COURSE OUTCOMES	
1	Analyse the structures for rolling loads and draw influence line diagrams with inferences
2	Analyse three hinged and two hinged cable and suspension bridges, Analyse the effect of unsymmetrical bending, determine location of shear center
3	Analyse three hinged and two hinged arches, Application of matrix methods in structural analysis

6CEU02: GEOTECHNICAL ENGINEERING – II

B.Tech. (Civil) 6th semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction to Scope of Subject**	1
	Stresses in Soil under surface loading: Bossinesq's and Westergaard's analysis for vertical pressure and its distribution in a soil mass. Vertical stresses due to concentrated loads, Horizontal and shear stresses due to concentrated loads. Isobar diagram, Vertical stress distribution on a horizontal plane. Influence diagram.	3
	Vertical stresses at point under line load and strip load. Vertical stresses at a point under circular and rectangular loaded area. Approximate methods of obtaining vertical pressure due to surface loading. Newmark's chart, Fensk's Chart. Pressure bulb and its significance in Foundation exploration. Contact pressure below foundations.	3
	Review of the Chapter	1
II	**Compressibility and Consolidation**: Introduction to consolidation, comparison of compaction and consolidation, Spring Analogy.	2
	Terzaghis one dimensional consolidation theory, Degree of consolidation, consolidation test, Compressibility parameters, co-efficient of consolidation. Preconsolidation pressure and its determination. Normally, Over and Under consolidated soils. Methods of computation of Settlement and its rate. Coefficient of consolidation for layered soil. Total and differential Settlement.	3
	Preconsolidation pressure and its determination. Normally, Over and Under consolidated soils. Methods of computation of Settlement and its rate. Coefficient of consolidation for layered soil. Total and differential Settlement.	2
	Review of the Chapter	1
III	**Stability of Slopes**: Classifications of slopes, Stability analysis of infinite slopes. Stability analysis of finite slopes by Swedish and Friction circle method.	2
	Stability analysis by Taylor's stability number, Taylor stability number curves. Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction. Bishop's method of stability analysis.	4
	Review of the Chapter	1
IV	**Earth Pressure**: Active, passive and earth pressure at rest. Rankine's and Coulomb's theories of earth pressure.	2
	Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill.	3
	Earth pressure on cantilever sheet piles Stability analysis of retaining walls.	2
	Review of the Chapter	1
V	**Bearing Capacity of Soils**: Terminology related to bearing capacity,	2

Common types of foundations. Terzaghi and Meyehoff's theory for bearing capacity.		
Rankine's method for minimum depth of foundation. Skempton's method. Effect of eccentricity and water table on bearing capacity.	**3**	
Plate load and penetration tests for determining bearing capacity. Introduction to pile, well and machine Foundations.	**2**	
Site Investigations: Methods of explorations. Planning of Investigations, Depth of exploration, Number of boreholes, Undisturbed and Disturbed samples. Types of samplers. Brief description of procedures of sampling, Transportation and Storage of samples. Geophysical methods of investigations	**2**	
Review of the Chapter	**1**	
TOTAL	**41**	

TEXT BOOK

1. Engineering in Theory & Practice Vol. I by Alam Singh, CBS Publishers and Distributers, Delhi. (2003)
2. Soil Mech. & Foundation Engineering by K.R. Arora, Standard Publishers and Distributers, Delhi.

REFERENCE BOOKS

1	Geotechnical Engineering by Purushottam Raj, Tata Mc Graw Hills, Delhi.	
2	Soil Mechanics in Engineering Practices by Terzaghi & Peck, John Wiley & Co.	**2010**
3	Theory and Practice Of Foundation Design by Som and Das, PRENTICE Hall of India Delhi (PHI).	**2003**
4	Soil Mechanics in Engineering and Practice by Terzaghi, CBS Publishers and Distributors.	
5	Geotechnical Engineering by Gulhati and Datta, Tata Mc Graw Hill, Delhi.	**2005**
6	An Introduction to Geotechnical Engineering by Robert D.Holtz, William D. Kovacs, Thomas C. Sheahan, Pearson Education Delhi.	**2013**
7	Design Aids in Soil Mechanics and Foundation Engineering by S.R.Kaniraj, Tata Mc Graw Hill, Delhi.	

COURSE OUTCOMES	
1	After completion of this course students will be able analyses the stresses in soil mass due to applied load such as point load, line load, strip load, circular load , rectangular load and its application in design of foundation
2	Students will be able to learn the fundamentals of consolidation soil. They will also be able to learn its process with time ie. Degrees of consolidation. Their application in computation of settlement under foundation.
3	Students will be able to learn safety analysis of slopes and their application in civil engineering construction such earth dams.
4	Students will learn effect of lateral pressures due to soil on structures. To analyses and design retaining structure.
5	Students will be able to learn to design various types of foundation.

6CEU03: ENVIRONMENTAL ENGINEERING – II

B.Tech. (Civil) 6th semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**General:** Terms: sewerage, domestic sewage, sewage treatment, disposal scope, Role of an Environmental engineer, historical overview. **Sewage Characteristics:** Quality parameters: BOD, COD, TOC, Solids, DO, Nitrogen, Phosphorus, Standards of disposal into natural watercourses and on land, Indian standards.	8
II	**Collection of Sewage:** Systems of sewerage, Separate, combined, and partially separate, components of sewerage systems, systems of layout, quantity of sanitary sewage and variations, quantity of storms water, rational method, shapes of sewer, Hydraulic design of sewers: diameter self cleansing velocity and slopes, construction and testing of sewer line, Sewer materials, joints and appurtenances, Sewage pumping and pumping stations, maintenance of sewerage system.	8
III	**Sewage Treatment:** Various units: their purpose, sequence and efficiencies, preliminary treatment, screening and grit removal units, oil and grease removal, primary treatment, secondary treatment, activated sludge process, trickling filter, sludge digestion and drying beds, stabilization pond, septic tank, soakage systems, recent trends in sewage treatment, advanced wastewater treatment :nutrient removal, solids removal.	8
IV	**Wastewater Disposal and Reuse:** Disposal of sewage by dilution, self-purification of streams, sewage disposal by irrigation sewage farming, waste waters reuse. **Plumbing for Design of Buildings:** Various systems of plumbing – one pipe, two pipes, single stack, traps, layout of house drainage.	8
V	**Air and Noise Pollution:** Air quality, Emission standards, vehicular pollution, Effect of air pollution on human health, Noise Pollution, global effect of air and noise pollution, green house effect, acid rain etc.	8
	TOTAL	40

REFERENCE BOOKS

1- Environmental Engineering II by B.C. Punmia, Arihant Publishers, Jodhpur.
2- Sanitary Engineering by SK Garg, Khanna Publishing Co.
3. Manual on Sewage and Sewage Treatment Ministry of Urban Development Govt. of India.
4. Water and Waste Water Engineering by Fair, G.M., Geyer G.C. and Okun D.A, Ann Arbor Sc. Publishing.

COURSE OUTCOMES	
1	Students will be able to understand the general terms related to sewage, sewage characteristics and Indian standards for disposal of sewage.
2	Students will be able to understand sewerage system, its components, method to find quantity, design of sewers and their testing, maintenance, etc.
3	Students will understand sewage treatment methods including primary, secondary and advance methods, activated sludge process, trickling filter, specific tank, etc.
4	Students will understand waste water disposal methods, dilution, self-purification, land

	treatment, plumbing systems.
5	Students will be able to understand air and noise pollution, standards of air quality, effect of air and noise pollution on human health, global effects, etc.

6CEU04: DESIGN OF CONCRETE STRUCTURES – I

B.Tech. (Civil) 6th semester   **Max. Marks: 100**

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	Objective and fundamental concepts of design of RC members, Types and function of reinforcement. Introduction to various related IS codes. Design Philosophies: Working stress, ultimate strength and limit states of design. Analysis and Design of singly reinforced rectangular beam section for flexure using Working Stress Method and Limit State Method.	8
II	Analysis and design of singly reinforced, flanged beams and doubly reinforced rectangular beams for flexure using Limit State Method. Limit state of serviceability for deflection, control of deflection as per codal provisions of empirical coefficients.	8
III	**Limit state of collapse in shear**: analysis and design of prismatic sections for shear using LSM. **Limit state of collapse in bond**: concept of bond stress, anchorage length and development length, curtailment of reinforcement as per codal provisions.	8
IV	Analysis and design of one way and two way slabs using LSM and Flat slab using direct design method as per code, Detailing of reinforcement.	8
V	Columns: Short and long columns, their structural behaviour. Analysis and design of axially loaded short columns, using LSM. Analysis of uniaxially eccentrically loaded short columns. Introduction to Pu-Mu interaction curves and their use for eccentrically loaded columns. Design of Column Footings: Analysis and design of Isolated column footing and combined footing for two columns (without central beam) for axial loads using LSM.	8
	TOTAL	**40**

REFERENCE BOOKS

1- Illustrated Reinforced Concrete Design by Karve & Shah; Standard Publishers, Delhi.
2- Limit State Design of Reinforced Concrete by Verghese P.C.; PHI Delhi.
3- Limit State Design by Dayaratnam; Oxford and IBH Publishing House.
4- Reinforced Concrete: Limit State Design by A.K.Jain; Nem Cahnd and Brothers, Roorkee.
5- Reinforced Concrete Structural Elements by P Purushothaman; Mc Graw Hill
6- Reinforced Concrete Fundamentals by Phil M. Ferguson; Prentice Hall
7- Design of reinforced Concrete by Jack C. Cormac & James K. Nelson; C.H.I.P.S.
8- Reinforced Concrete Design by Wang & Salmon; Harper & Row.
9- Design of Concrete Structures by Nilson & Winter; Mc Graw Hill

COURSE OUTCOMES	
1	After completing the course, the students will understand the behaviour and concept of various RCC members like beam, columns, slab, footing etc. and to perform their analysis and design using Limit state design as per code provision IS: 456:2000.

6CEU05: TRANSPORTATION ENGINEERING – I

B.Tech. (Civil) 6th semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction**: Importance and Role of Transportation Systems, Technological and Operating Characteristics of Transportation Systems, Components of transportation Systems, Transportation Coordination, Transportation Modes and their comparison. **Highway Planning**: Highway Planning Process, specifically in India, Transport or Highway related Agencies in India, Classification of Roads and Road Development Plans, Road Patterns, Controlling Factors and Surveys for Highway Alignment.	8
II	**Highway Materials and Construction**: Desirable Properties, Testing Procedures, Standards and standard values relating to Soil, Stone Aggregates, Bitumen and Tar, fly-ash/pond-ash. Methods of constructing different types of roads viz. Earth roads, Stabilized roads, WBM roads, fly ash embankments, Bituminous roads and Concrete roads. Specific features of rural roads. Equipments for highway construction of rigid and flexible pavements.	8
III	**Highway Geometric Design**: Cross Sectional Elements, camber, Sight Distances – definition and analysis of SSD and OSD, Design of Horizontal Alignment – Super elevation, extra widening, transition curves. Design of Vertical Alignment – Gradients, Vertical curves. Recommendations Indian Road congress code of Practice.	8
IV	**Elementary Traffic Engineering**: Significance of different Traffic Engineering Studies viz. Speed, Volume, O & D, Parking and Accident's Study. Importance and types of Traffic Signs, Signals, Road Markings and Road Intersections.	8
V	**Structural design of Highway Pavements**: Design of Flexible Pavements by G. I. and CBR methods. Design of Rigid Pavements by Westergard and modified methods. Design as guide lines of relevant Indian Road congress code of Practice. **Hill Roads**: Special factors in Alignment and Geometric design, Drainage and maintenance of Hill roads. Road side Arboriculture and Landscaping. Recent Developments in Urban Roads and their role in economic developments.	8
	TOTAL	40

REFERENCE BOOKS

1. Highway Engineering by Khanna SK & CG Justo, Nem Chand and Brothers, Roorkee.
2- Highway Engg. by L.R. Kadiyali, Khanna Tech Publications, Delhi.
3- Specification for Roads & Bridges by Ministry of Road Transports & Highways and Indian Road Congress.
4. Transportation Engineering and Planning, 3rd ed., Papacostas & Prevedouros, PHI Publishers.
5. Highway Engineering by Rangawala, Charotar Publishing House.

COURSE OUTCOMES	
1	Students will be able to understand the basic characteristics of transportation planning and of the models used by transportation planners.
2	Students will be able to conduct experiments on materials for Highway Engineering and to develop technical skills for utility, operation and maintenance of equipments used in highway construction.
3	Students will be able to understand the basic concepts of geometric design of highways by applying fundamental concepts of Mathematics and Laws of Mechanics, Develop technical skills for designing Horizontal & Vertical Alignment of highways.
4	Students will be able to understand the basic concepts of traffic data analysis, Develop technical skills for operations and design of road junction.
5	Students will be able to design both flexible and rigid pavements, develop the understanding of various BIS, IRC and ISO standards and to design the highways in conformity with these codes.

6CEU6.1: REMOTE SENSING AND GIS

B.Tech. (Civil) 6th semester

Max. Marks: 100

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Photogrammetry:** Definition of Photogrammetric Terms, Geometry of aerial and terrestrial photographs, Aerial camera and photo-theodolite, Scale of a Photograph, Tilt and Height displacements, Stereoscopic vision and stereoscopes, Height determination from parallax measurements, Flight planning, Maps and Map substitutes and their uses.	8
II	**Remote Sensing:** Introduction and definition of remote sensing terms, Remote Sensing System, Electromagnetic radiation and spectrum, Spectral signature, Atmospheric windows.	8
III	Different types of platforms, sensors and their characteristics, Orbital parameters of a satellite, Multi concept in Remote Sensing.	8
IV	**Image Interpretation:** Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth – collection and verification, advantages of multidate and multiband images. Digital Image Processing concept.	8
V	**Geographic Information System (GIS) :** Introduction & applications of GIS in map revision, Land use, Agriculture, Forestry, Archaeology, Municipal, Geology, water resources, Soil Erosion, Land suitability analysis, change detection.	8
	TOTAL	40

REFERENCE BOOKS

1. Basics of Remote Sensing & GIS by Dr. S.Kumar , Univertsity Sc. Press.
2- Geographic Information System by Kang Tsung Chang, Tata Mc Graw Hills.
3. Remote Sensing and GIS by Legg.C.A., Ellis Horwood, London.
4. Remote sensing and GIS by Bhatt Oxford University Press.

COURSE OUTCOMES	
1	Providing reliable measurements of objects.
2	Remote Sensing & GIS recognized as supporting tools for Planning, monitoring and

	managing the appropriate utilization of the earth resources in multidisciplinary applications.
3	Measures electronics radiation reflected or emitted from the terrain.
4	Providing reliable measurements of objects.
5	Remote Sensing & GIS recognized as supporting tools for Planning, monitoring and managing the appropriate utilization of the earth resources in multidisciplinary applications.

6CEU07: GEOTECHNICAL ENGINEERING LAB – II

1. To determine the differential free swell index of soil.
2. To determine the grain size distribution of fine grained soil by Hydrometer.
3. To determine the CBR of soil.
4. To determine the compressibility parameters of soil by consolidation test.
5. To determine the swelling pressure of soil.
6. To determine the permeability of soil by constant and falling head methods.
7. To determine the shear strength parameters of soil by tri-axial test.
8. Design problems based different units of theory syllabus.

COURSE OUTCOMES	
1	After completion of this course, the students will be competent to handle the design problems of earth dams, embankment slopes, road pavement and foundations.
2	They will also be competent to practically determine the various soil parameters required in above design problems.

6CEU08: ENVIRONMENTAL ENGINEERING LAB – II

1. To determine the pH of the given sample of sewage.
2. To determine Total Solids of the given sewage sample.
3. To determine the Total Dissolved Solids of the given sewage sample.
4. To find out Total Settle-able Solids of the given sewage sample.
5. To determine Total Suspended Solids of the given sewage sample.
6. To find out the Quantity of Dissolved Oxygen present in the given water sample by Winkler's Method.
7. To determine Biochemical Oxygen Demand exerted by the given wastewater sample.
8. To find out Chemical Oxygen Demand of the waste water sample.
9. To study various Sanitary Fittings.
Design as per syllabus of theory.

COURSE OUTCOMES	
1	Students will be able to perform analysis of various parameters of wastewater.
2	Students will be able to design various wastewater treatment processes.

6CEU09: CONCRETE STRUCTURES DESIGN – I

Design problems as per different units of syllabus of theory.

COURSE OUTCOMES	
1	After doing this course students were able to understand the various complexity involved in doing the analysis and design of real structural members & were able to apply the concepts of RCC to real structural members.

6CEU10: ROAD MATERIAL TESTING LAB

1. Aggregate Impact test
2. To determine the flakiness index & Angularity number test of given sample of aggregate.
3. To determine fineness modulus of a given sample of coarse aggregate.
4. Los angles abrasion test
5. Aggregate crushing value test
6. Specific gravity and water absorption test of aggregate.
7. Standard tar viscometer test
8. To determine the elongation index for given sample of aggregate.
9. Ductility test
10. To determine the softening point for give sample of bitumen.
11. Marshell stability test
12. Float test

COURSE OUTCOMES	
1	After completion of this course, students will be able to analysis and calculate aggregate properties for design of roads/highways.

7CEU01: WATER RESOURCES ENGINEERING – I

B.Tech. (Civil) 7th semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction:** Definitions, functions and advantages of irrigation, present status of irrigation in India, classification for agriculture, soil moisture and crop water relations, Irrigation water quality. Consumptive use of water, principal Indian crop seasons and water requirements, multiple cropping, hybrid crops, water harvesting and conservation.	8
II	**Canal Irrigation:** Types of canals, parts of canal irrigation system, channel alignment, assessment of water requirements, estimation of channel losses, design of channels, regime and semi theoretical approaches (Kennedy's Theory, Lacey's Theory), cross section of channels, silt control in canals. **Water Distribution System:** Rotational delivery (Warabandi, Jama Bandi, Khasra Bandi, Sajra Sheets), continuous delivery and delivery on demand, Role of command area development authority, Functions and organizational structures.	8
III	**Distribution of Canal Water:** System of regulation and control, outlets, assessment of canal revenue. **Hydraulics of Alluvial Rivers :** Critical tractive force, regimes of flow, resistance relationship for natural streams, bed load, suspended load and total equations, different stages of rivers, meandering, aggradations, and degradation, river training & bank protection works.	8
IV	**Water Logging:** Causes, preventive and curative measures, drainage of irrigated lands, saline and alkaline lands, types of channels lining and design of lined channel.	8

	Well Irrigation: Open wells and tube wells, types of tube wells, duty of tube well water.	
V	**Hydrology:** Definition, Hydrologic cycle, Application to Engineering problems, measurement of rainfall, rain gauge, peak flow, flood frequency method, catchment area formulae, Flood hydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination, Estimation of run off.	**8**
	TOTAL	**40**

REFERENCE BOOKS

1- Irrigation Water Power and Water Resource Engineering by KR Arora, Standard Publishers and Distributers, Delhi.
2- Water Resource Engineering by Modi, Standard Publishers.
3-Irrigation and Water Power Engineering by BC Punmia & B B Lal, Laxmi Publication (P) Ltd.
4. Irrigation Engineering by G.L. Asawa, New Age International Publishers, New Delhi.

COURSE OUTCOMES	
1	Students will be able to apply skill developed in irrigation department.
2	Students will be able o design canal and related consultancy.
3	Students will be able to train river and bank protection.
4	Students will be able to develop skills of making an area water logging free.
5	Students will be able to remedy out the floods in a city & design of sewers etc.

7CEU02: DESIGN OF STEEL STRUCTURES – I

B.Tech. (Civil) 7th semester   **Max. Marks: 100**
                                                                     Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction:** Types of steels and their broad specifications. **Plastic Analysis:** Plastic analysis of steel structures, fundamentals, static and mechanism method of analysis, bending of beams of rectangular and I sections beams, shape factor. Classification of Cross Sections: As per IS 800-2007 Plastic, compact, semi compact, slender sections, their characteristics including moment- rotation.	**8**
II	**Connections:** Types of bolts, load transfer mechanism, prying action. Design of bolted and welded connections under axial and eccentric loadings. **Tension Members**: Design strength in gross section yielding, net section rupture and block shear. Design of axially loaded tension members.	**8**
III	**Compression Member**: Types of buckling. Column buckling curves, Imperfection factor, Buckling curves for different cross sections. Design of compression member; Axially loaded compression members including angle section design: single and in pair, built up columns, design of lacings and battens.	**8**
IV	**Beams**: Design of beams: simple and compound sections, main and subsidiary beams and their connections. Laterally supported and unsupported beam design, Web buckling, web crippling, lateral torsional buckling.	**8**
V	**Member design under combined forces:** Compressive load and uniaxial moment. tension and uniaxial moment **Column Bases**: Design of column bases, Slab base, gusseted base for axial and eccentric compressive load. Grillage foundation design.	**8**
	TOTAL	**40**

REFERENCE BOOKS

1-Design of Steel Structures by N. Subramanian, Oxford University Press.

2. Limit state Design of Steel Structures: S K Duggal, TMH publication

3- Design of Steel Structures by S. Bhavikatti, I.K. International Pvt. Ltd.

4- Design of Steel Structures by V.L. Shah, Structures Publications.

COURSE OUTCOMES	
1	Students will be able to understand basics of steel structures and Plastic analysis
2	Students will be able to design Steel fasteners and Tension members
3	Students will be able to design Compression members along with Lacing and Battens
4	Students will be able to design Laterally supported and Unsupported Beams, Column bases and Slab Bases

7CEU03: DESIGN OF CONCRETE STRUCTURES – II

B.Tech. (Civil) 7th semester **Max. Marks: 100**
 Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Elements of Pre-stressed Concrete:** Principles and systems, material properties, losses of pre-stress, I.S. specifications, analysis and design of rectangular and T sections for flexure and shear.	8
II	**Torsion:** Analysis and Design of beams for torsion as per codal method. **Continuous and Curved Beams:** Analysis and Design of continuous beams using coefficients (IS Code), concept of moment redistribution. Analysis and design of beams curved in plan.	8
III	**Circular Domes:** Analysis and design of Circular domes with u.d.l. & concentrated load at crown. **Water Tanks and Towers:** Water Tanks and Water Towers-design of rectangular, circular and Intze type tanks, column brace type staging.	8
IV	**Yield Line Theory:** Introduction to Yield line concept, Application of Y.L.T. to slabs with simple support conditions. **Retaining walls:** Analysis and design of Cantilever Retaining Walls: Introduction to counterfort and buttress type retaining walls, their structural behaviour and stability analysis.	8
V	**Culverts and Bridges:** Analysis and Design of super structure of slab culverts and T-bridge for I.R.C. loading.	8
	TOTAL	40

REFERENCE BOOKS
1. Reinforced Concrete Vol. II by H.J. Shah; Charotar Publication House.
2. Advanced Reinforced Concrete Design by Verghese; Tata Mc Graw Hill.
3. Advanced Reinforced Concrete Design by Krishnaraju; Tata Mc Graw Hill.
4. Bridge Engineering by Ponnuswamy; Tata Mc Graw Hill
5. Prestressed Concerte Structures by N. Krishna Raju; Tata Mc Graw Hill.
6. Bridge Engineering by Johnson Victor; Oxford and IBH Publishers.
7. Prestressed Concrete by T.Y.Lin and Burn; John Wiley & Sons.
8. Reinforced Concrete Structures by Park & Poulay; Willey.
9. Reinforced Concrete Designers Hand Book By Reynolds & Steedman

10. Manual of Concrete Practice ACI (www.concrete.org)
11. Prestressed concrete structures by Praveen Nagrajan, Pearsons

COURSE OUTCOMES	
1	Students will be able to apply the basic concepts to learn more advanced and popular structure like domes, water tanks, retaining wall, curved beams. Also the students will be in position to appreciate the use of yield line analysis. Slope and prestressing concept of the heavily loaded members after doing this course students will be in position to supervise, analyze and design of such structures.

7CEU04: TRANSPORTATION ENGINEERING – II

B.Tech. (Civil) 7th semester   **Max. Marks: 100**
                                                    Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Introduction and Permanent Way Components**: Types and Selection of Gauges, Selection of Alignment, Ideal Permanent Ways and Cross-sections in different conditions, Drainage, Salient Features and types of Components viz. Rails, Sleepers, Ballast, Rail Fastenings. **Study of Specific Aspects**: Coning of Wheels, Creep, Wear, failures in Rails, Rail Joints, Length of Rail, Sleeper Density and Spacing, Stations, Yards and Sidings, Turn-Table, Signaling.	8
II	**Points and Crossings**: Types of Turnouts, Points or Switches, layout Plans of different types of Crossings, Design calculations of turnouts. **Railway Systems Specific to Urban Movements**: Surface railways (sub urban railway system of Mumbai, Chennai and Delhi), Underground system (Metro of Kolkata/ Delhi), Elevated Systems (as Proposed for Jaipur, Delhi, Mumbai), Light Rail System (MRTS, Thane). Recent Developments in Railway Networking.	8
III	**Geometric Design**: Gradient and Grade Compensation, Super elevation and cant, cant deficiency, Types of Curves, Transition curves, their designs, Widening of Gauges.	8
IV	**Airport Engineering:-Introduction**: Requirements to Airport Planning, Airport Classifications, Factors in Airport Site Selection, Airport Size, Obstructions, Zoning. **Planning and Design of Airport**: Requirements of Airport, Planning of Terminal Area, and different Layouts, Location of Gates, Types of Runway patterns, Runway Layout, Runway Length, Geometric Design of Runways, Layout of Taxiways, Geometric Standards, Exit or Turnaround Taxiways, Apron and Hangers.	8
V	**Airport Pavement Design**: Factors Affecting Pavement Design, Design methods of Flexible Pavements, Design methods of Rigid Pavements.	8
	TOTAL	40

TEXT BOOK:
1. Railway Engineering by Sexena S.C. and Arora S.P, Dahnpat Rai Publishers, Delhi.
2- Airport Engineering by Rangwala,Charotar Publishing House.

REFERENCE BOOK:

1- Transportation Engineering by A.K. Upadhyay, S.K.Kataria and Sons.

2. Railway Engineering by Satish Chandra and M.M Agarwal, Oxford University Press, Delhi.

COURSE OUTCOMES	
1	Students will be able to understand the basic characteristics of the railway engineering components and specific aspects.
2	Students will be able to understand the basic characteristics of turnouts, points or switches, layout plans of different types of crossings, design calculations of turnouts, characteristics of surface railways and recent developments in railway networking.
3	Students will be able to understand the basic concepts of geometric design of railway tracks.
4	Students will be able to understand the basic Principles of Airport Engineering and design of airport runways.
5	Students will be able to design both flexible and rigid pavements.

7CEU05: APPLICATIONS OF NUMERIAL METHODS IN CIVIL ENGG.

B.Tech. (Civil) 7ᵗʰ semester

Max. Marks: 100

Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Errors & Approximations in Numerical Computation:** Introduction to Mathematical Modeling and Engineering Problem Solving. Decimal & Binary Number system. Accuracy, Precision and Significant Digits. Errors and their types.: absolute and relative errors, approximations and round off errors, truncation errors and Taylor's series. Propagation of errors.	8
II	**Roots of Equations**: Iterative processes and their Convergence. Existence of roots in engineering practices & their geometrical representation. Roots of the equations by: Graphical Method, Method of Successive Substitution, Bisection Method, False Position Method, Newton-Raphson Method, Secant Method, Regula Falsi Method. Application to simple civil engineering problems.	8
III	**Matrices and Determinants**: Their types and basic operations. Rank of a matrix. Solution of Linear system of equations by Direct methods: Cramer's Rule, Gaussian elimination method, Gauss-Jordan Method and Cholesky Method. Application to simple civil engineering problems.	8
IV	**Iterative Methods for solving Linear system of equations**: Jacobi Method, LU decomposition and Matrix inversion, Gauss Seidel method. Application to simple civil engineering problems.	8
V	**Interpolation and Curve Fitting:** Newton's Forward Difference, Newton's Backward Difference, Newton's Central Difference, Newton's Divided Difference, Lagrangian Interpolation, Hermitian Interpolation, Method of least square. Application to simple civil engineering problems.	8
	TOTAL	**40**

REFERENCE BOOKS

1. Introductory Methods of Numerical Analysis, Sastry S.S., Prentice Hall India

2. Numerical Methods for Engineering and Scientific Computation, Jain and Jain, New Age International Pvt. Ltd. New Delhi.

3. Engineering Statistics, Bowker, A.H. and Liberman G.J., Prentice Hall.

4. Probability and Statics in Engineering, Hines, John Willey and Sons.
5. Applied Statistics and Probability for Engineers, Montgomery, John Wiley and Sons.
6. Numerical Methods for Engineers by S.C. Chapra & R.P. Canale, Tata McGraw Hill
7. Numerical Methods in Science and Engineering by S. Rajasekaran, Wheeler Publishing

COURSE OUTCOMES	
1	After successfully doing this course students are found more comfortable with analysis & design problems like analysis of multi-storey buildings, structural dynamics/Vibrations, Seismic analysis, Wind load analysis, Project planning etc.

7CEU6.3: RURAL WATER SUPPLY AND SANITATION

B.Tech. (Civil) 7th semester **Max. Marks: 100**
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**General:** Importance of village community in India, Condition of Indian villages with special regard to economics, social and health aspects. **Sources of water:** Traditional sources of water in rural areas. Different types of wells, sanitary aspects in well construction, pumps used for village wells, Hand pump Technology, its operation and maintenance. Water harvesting techniques.	8
II	**Quality of water:** Estimation of total water requirement including cattle water demand, quality of water needed for village community, water quality surveillance, standards of water quality. **Communicable Diseases:** Diseases and immunity, Source of communicable diseases, Mode of transfer, Control of communicable diseases, Guinea worm Eradication.	8
III	**Water Treatment:** Slow sand filter, horizontal roughing filter and their combination. Disinfection of rural water sources, Fluoride and its removal. **Schemes of Rural water supply:** Different Schemes of Rural water supply in Rajasthan, Their Design and project formulation including the programmes and standards laid by Govt. of India and Govt. of Rajasthan.	8
IV	**Milk and Food sanitation:** Essentials of dairy farm and cattle shed sanitation, Tests for milk and dairy products, food epidemics, food poisoning, Botulism. **Fly and Mosquito control:** Life cycle of flies and mosquitoes, various methods of flies and mosquito control.	8
V	**Rural Sanitation:** Village latrines, VIP latrines, pour flush latrines, materials, construction and cost of the latrines, Pollution aspects and pollution travel from latrines. Storm water and sludge problems. Septic tank, soak pit, small bore sewer system; its design and construction. Animal waste, method of composting, Biogas, collection and disposal of wastes. **Community Awareness and user participation:** Planning of communication support in rural supply and sanitation projects.	8
	TOTAL	**40**

REFERENCE BOOKS
1 Rural Water Supply & Sanitation Manual by Govt. of India

2. Municipal and Rural Sanitation E.W.Steel, Mc Graw Hill Book Co.
3. Reports of Rajeev Gandhi National Drinking Water Mission

COURSE OUTCOMES	
1	Students will be able to know about Indian villages and various sources of water in rural areas like hand pumps and its working.
2	Able to know the requirement of village community with respect to quantity and quality. Various sources of communicable disease and their control, mode of transfer.
3	Able to know about treatment facility required in villages and its design.
4	Able to know rural sanitation various kind of disposal, septic tank etc.
5	Able to know rural sanitation, various kind of disposal, septic tank etc. Able to know about the planning and advantages of community awareness and participation of uses in schemes of villages.

7CEU07: DESIGN OF WATER RESOURCES STRUCTURES – I

Design Problems as per syllabus of theory.

COURSE OUTCOMES	
1	Student will be able to develop skills of practical.
2	Application of various designs & can do consultancy design work.

7CEU08: STEEL STRUCTURES DESIGN – I

Design Problems as per different units of syllabus of theory.

COURSE OUTCOMES	
1	After completing the course of DSS-I (Design) Students were more confident and learn the basic concept of design of different type of connections, like bolting and welding, Design of tension member, compression member, & Design of beam, column bases & grillage foundations. Concept of web buckling & crippling. This understanding will help students in design related works.

7CEU09: CONCRETE STRUCTURES DESIGN – II

Design Problems as per different units of syllabus of theory.

COURSE OUTCOMES	
1	After completing this, students will be more confident and will learn the application of basic concept of R.C.C to real life structures. This understanding will help them in getting the jobs in various construction companies.

7CEUTR: PRACTICAL TRAINING AND INDUSTRIAL VISIT

COURSE OUTCOMES	
1	Student will be able to understand the field practices, they will be learning the application of theory and will be known material properties & tests, estimating and costing and structural aspects in civil engineering.

8CEU01: WATER RESOURCES ENGINEERING – II

B.Tech. (Civil) 8th semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Regulation of works:** Falls, Classification of falls, Design of falls, Distributory head regulator and cross-head regulator, Escape, bed bars. **Cross-Drainage Structure:** Necessity of Cross-drainage structures, their types and selection, comparative merits and demerits, design of various types of cross-drainage structure-aqueducts, siphon aqueduct, super passage siphon, level crossing and other types.	8
II	**Diversion Head works:** Design for surface and subsurface flows, Bligh's and Khosla's methods. Selection of site and layout, different parts of diversion head works, types of weirs and barrages, design of weirs on permeable foundation, silt excluders and different types of silt ejectors. Energy dissipation.	8
III	**Embankment Dams:** Suitable sites, causes of failures, stability and seepage analysis, flownet, slope stability analysis, precautions of piping, principles of design of earth dams. **Gravity Dams:** Force acting on a gravity dam, stability requirements, Instrumentation.	8
IV	**Spillways:** Spillway capacity, flood routing through spillways, different types of spillways and gates, energy dissipation below spillways. **Hydro Power Plant:** General features of hydroelectric schemes, elements of power house structure, selection of turbines, draft tube and setting of turbine, cavitations.	8
V	**Reservoirs:** Evaluation of impact of water projects on river regimes and environment. Reservoir sedimentation and water shed management. **Optimization:** Introduction to optimization techniques and system approach. Introduction to G.I.S. and Computer aided irrigation design.	8
	TOTAL	40

TEXT BOOK:
1. Theory and Design of Irrigation Structures by Varshney Gupta and Gupta, Nem Chand & Brothers, Roorkee.

REFERENCE BOOKS
1- Irrigation Water Power and Water Resource Engineering by KR Arora, Standard Publishers and Distributers, Delhi.
2- Water Resources Engineering by Modi, Standard Publishers.
3. Fundamentals of Irrigation Engineering by Bharat Singh, Nem Chand Brothers, Roorkee.

COURSE OUTCOMES	
1	Understand working of Cross-Drainage Structures and their types, evaluate necessities and types of falls and be able to design falls accordingly.
2	Understand Khosla's Theory, analyse site selection criteria for weir and barrage and then design for energy dissipation.
3	Analyse forces acting on dams and it's stability, critically review site selection for dams and perform seepage analysis and slope stability for earthen dams.

4	Understand hydroelectric power plant system and types of spillways, evaluate routing methods and review it's usage with spillways.
5	Evaluation of impact of water projects on river regimes and reservoirs. Understand optimization techniques and be able to evaluate for GIS based watershed management.

8CEU02: DESIGN OF STEEL STRUCTURES – II

B.Tech. (Civil) 8th semester   **Max. Marks: 100**
                                                          Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	Design of gantry girder. Design of roof trusses including wind loading and purlin design, Introduction to Pre Engineered Buildings and tubular sections and their applications.	8
II	**Design of plate girder**: Design of welded and bolted sections. Connections for flange plate to flange angles and flange angles to web, etc. Design of welded connections. Web and flange splicing. Horizontal, Intermediate and Bearing stiffeners. Curtailment of plates. Shear strength determination by post critical and tension field action methods. End panel design options and procedure as per IS 800.	8
III	**Bridges**: Types of bridges, Loadings, Standard loading for railway bridges, Design of Deck type plate-girder bridges, design of its bracings and frames.	8
IV	Design aspects of foot over bridges. Design of through type truss girder bridges including stringer design, cross girder design, main truss members, portal and sway bracings etc.	8
V	Water tanks, circular tanks with segmental bottoms, rectangular tanks, pressed steel tanks, design of staging.	8
	TOTAL	**40**

REFERENCE BOOKS

1-Design of Steel Structures by S. Bhavikatti, I.K. International Pvt. Ltd.

2- Design of Steel Structures by V.L Shah, Structures Publications.

3. Limit State Design of Steel Structures: S K Duggal- Tat Mc Graw Hill

4-Design of Steel Structures by N. Subrananian, Oxford University Press.

5-Design of Steel Structures by B.C. Punmia Laxmi Publication

6-Design of Steel Structures Vol. II by Ram Chandra, Standard Publishers.

COURSE OUTCOMES	
1	Students will be able to design a gantry girder for an industrial building, to carry E.O.T & M.O.T and will be able to design "I" section purlin and study about wind pressure.
2	Students will be able to design plate girder with different type of connections for flange plate to flange angle , & flange angle to web & other design option as per IS : 800
3	Students will be able to understand various types of bridges & their loading and design steps of deck type plate girder bridges with bracing & frames.
4	Students will be able to understand the design aspects of foot over bridges & design of through type truss girder bridges including stringer design, cross girder design, portal & sway bracings.
5	Students will be able to understand the design of different type of water tanks as, circular tank with segmental bottoms, rectangular tanks, pressed tanks, & design of staging.

8CEU03: PROJECT PLANNING & CONSTRUCTION MANAGEMENT

B.Tech. (Civil) 8ᵗʰ semester

Max. Marks: 100
Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**FINANCIAL EVALUATION OF PROJECTS AND PROJECT PLANNING:** Capital investment proposals, criterions to judge the worth whileness of capital projects viz. net present value, benefit cost ratio, internal rate of return, Risk cost management, main causes of project failure. Categories of construction projects, objectives, project development process, Functions of project management, Project management organization and staffing, Stages and steps involved in project planning, Plan development process, objectives of construction project management.	8
II	**PROJECT SCHEDULING:** Importance of project scheduling, project work breakdown process – determining activities involved, work breakdown structure, assessing activity duration, duration estimate procedure, Project work scheduling, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis.	8
III	**PROJECT COST AND TIME CONTROL:** Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, cost slope, Process of crashing of activities, determination of the optimum duration of a project, updating of project networks, resources allocation.	8
IV	**CONTRACT MANAGEMENT:** Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work, breach of contract, determination of a contract, arbitration.	8
V	**SAFETY AND OTHER ASPECTS OF CONSTRUCTION MANAGEMENT:** Causes and prevention of accidents at construction sites, Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Project Management Information System – Concept, frame work, benefits of computerized information system. Environmental and social aspects of various types of construction projects.	8
	TOTAL	40

TEXT BOOK: 1.Project Management with CPM /PERT by B.C. Punmia, Laxmi Publication (P) Ltd.

REFERENCE BOOKS
1. Construction Project Management by K.K. Chitkara, Tata Mc Graw Hills.
2- Project Management by Modder & Phillph, CBS Publishers.

COURSE OUTCOMES	
1	Students will be able to analyze the financial aspect of projects and about various stages of planning of projects and its requirement.
2	Students will be able to know the project scheduling process, various activities involved, work breakdown structures and concept and advantages of network analysis.
3	Students will be able to know about direct and indirect costs of project, determination of optimum duration of project and updating of project networks.
4	Students will be able to know about contract management, its legal aspects, negotiation and

5	Students will be able to know about causes and prevention of accidents, safety measures, concept of MIS, framework and social and environmental aspects of various projects.

8CEU6.2: ADVANCED FOUNDATION ENGINEERING

B.Tech. (Civil) 8th semester   **Max. Marks: 100**
                                                                    Exam Hours: 3

UNIT	CONTENTS	CONTACT HOURS
I	**Shallow Foundation**: Methods of estimation of bearing capacity, computation of bearing capacity factors, Effect of eccentric and inclined loads, effect of water table on bearing capacity, Terzaghi, Vesic, Hansen, Moyerhof's analysis, Bearing capacity of stratified soils. IS code recommendations for minimum depth, factor of safety, design for local shear and general shear failure.	8
II	**Settlement Under Foundation**: Methods of estimation of settlement of footings. Limits of settlements for various structures, Indian Standard Code Provisions (IS: 1904, 6403, 8009). Determination of allowable bearing capacity as per IS code. Schemartman's method, Dee beer's and Mortin method of finding out settlement from static cone penetration test. Methods of finding out bearing capacity from plate load test, standard penetration test data.	8
III	**Pile Foundation**: types of pile and their use, modes of failure. Bearing capacity and settlement of pile foundation. Types of piles, Allowable load, Pile load test, Dynamic and static formulae. Bearing Capacity factors. Pile group bearing capacity and settlement. Negative skin friction. Behavior of piles under lateral loading. Winkler's assumption. Pile resistance and deflection under lateral loads, elastic method, Brooms method.	8
IV	**Foundation on Difficult Soils:** Collapsible soil; identification, Collapse settlement: foundation design. Sanitary landfills settlement of sanitary land fills. **Expensive soils**: Behaviour of expansive soil, foundation practices, under-reamed piles. Methods of finding out load carrying capacity of under reamed piles in clayey and sandy soil. Provision of IS 2911 Part III-1980 for design of under-reamed pile foundations.	8
V	**Raft foundation:** Common types of raft, combined footing. Bearing capacity of raft, differential settlement of raft; semi empirical method of design of raft foundation. **Well foundations**: design and construction. Bearing capacity, settlement and lateral resistance. Tilts and shifts, IS and IRC codes methods.	8
	TOTAL	**40**

REFERENCE BOOKS
1- Basic & Applied Soil Mechanics -by Ranjan & Rao, New Age International Publishers.
2- Geotechnical Engineering by Gulhati & Dutta , Tata Mc Graw Hills, Delhi.
3- Design Aids in foundation engineering by Kaniraj, Tata Mc Graw Hills, Delhi.

COURSE OUTCOMES	
1	The student shall be able to determine the safe and allowable load carrying capacity of various types of foundations resting on different types of soil strata. Dynamic parameter of soil foundation system shall also be known to the students which enable them for design of machine foundation.

8CEU07: DESIGN OF WATER RESOURCES STRUCTURES – II

Design as per syllabus of theory.

COURSE OUTCOMES	
1	Students will be able to design dams, slip structure, spillways, drainage works etc.

8CEU08: PROFESSIONAL PRACTICE AND ESTIMATING

1. Estimates – Methods of building estimates, types; site plan, index plan, layout plan, plinth area, floor area; Technical sanction, Administrative approval; estimate of buildings, roads, earthwork and R.C.C. works.
2. Analysis of rates- for earthwork, concrete work, D.P.C., stone masonry,, plastering, pointing and roadwork.
3. Specifications- For different classes of building and Civil Engineering works.
4. Types of contracts – Tenders, tender form, submission and opening of tenders, measurement book, muster roll, piecework agreement and work order.
5. Arbitration
6. Valuation of real estate.

COURSE OUTCOMES	
1	Students will be able to prepare estimates of buildings, roads, earthwork and RCC work.
2	Students will be able to prepare rate analysis for various items of works.
3	Students will be able to understand specifications for buildings and civil engineering works.
4	Students will learn about contracts, tenders and related technical terminology.
5	Students will understand the methods of arbitration and valuation of properties.

8CEU09: STEEL STRUCTURES DESIGN – II

Design as per different units of syllabus of theory.

COURSE OUTCOMES	
1	Students will be able to design a gantry girder, plate girder, "I" section, purlins, through type truss girder bridge & deck type plate girder bridge. Also will be able to design of water tanks as, circular tank, rectangular tanks with pressed steel tanks, & design of staging. This understanding will help them to getting jobs at design engineer and also do consultancy work related to steel structures.

8CEU10: DESIGN OF FOUNDATIONS

1. Design of isolated shallow footings, combined footings, raft foundations.

2. Design of pile foundations.

3. Design of wells and cassions.

4. Design of machine foundation.

5. Design of retaining structures etc.

COURSE OUTCOMES	
1	The students shall be able to design the foundations of various types, keeping in view the load provisions under shear and settlement. They will also be able to determine safe load carrying capacity and settlement by field tests e.g. plate load, pile load tests and SPT tests.

8CEU11: STRUCTURAL ANALYSIS BY MATRIX METHODS

Introduction to matrix methods; Stiffness (Deflection) and Flexibility (Force) matrices for bar, plate, and beam elements w.r.t. local axes and global axes, for entire structure w.r.t. global axes (Direct method and by assembly method. Introduction of Finite Element Methods.

COURSE OUTCOMES	
1	Student will be able to apply energy theorem, reciprocal theorem, and virtual work concept. Students will be able to prepare stiffness and flexibility matrices by direct method and by general approach for 2D structures such as beam and pin jointed frames.

8CEUSM: SEMINAR

COURSE OUTCOMES	
1	Students will learn about the latest development in a particular subject and also develop skill for writing a report and its presentation.

8CEUPR: PROJECT

COURSE OUTCOMES	
1	Students will be able to work in a group for a practical/research oriented task related to civil engineering.
2	Students will be able to develop skills of technical report writing and comprehension of results etc.
3	Students will get exposure to new technological areas.
4	Students will be able to apply their knowledge in real life problems.