Department of Civil Engineering

**SCHEME OF INSTRUCTION & SYLLABUS
FOR**

**B.Tech. (CIVIL ENGINEERING)
&
B.Tech. + M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)**

Department of Civil Engineering

A.U. College of Engineering (A)

Visakhapatnam

Department of Civil Engineering
SCHEME OF INSTRUCTION & SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

II Year – I Semester

S.No	Sub Code	Category	Subject Name	L	T	P	C	I	E	TM
1	CE2101	BSC	Mathematics-IV	2	1	-	3	30	70	100
2	CE2102	ESC	Engineering Geology	3	-	-	3	30	70	100
3	CE2103	PCC	Mechanics of Materials	3	1	-	3	30	70	100
4	CE2104	PCC	Surveying-I	3	-	-	3	30	70	100
5	CE2105	ESC	Engineering Mechanics	3	2	-	3	30	70	100
6	CE2106	PCC	Building Materials and Building Construction	3	-	-	3	30	70	100
7	CE2107	MC	Environmental Studies	2	1	-	2	30	70	100
8	CE2108	PCC	Materials, Testing and Evaluation Lab	-	-	3	1.5	50	50	100
9	CE2109	PCC	Surveying Field Work	-	1	2	1.5	50	50	100
			Total	**19**	**6**	**5**	**23.0**	**310**	**590**	**900**

II Year - II Semester

S.No	Sub Code	Category	Subject Name	L	T	P	C	I	E	TM
1	CE2201	PCC	Surveying - II	3	-	-	3	30	70	100
2	CE2202	PCC	Fluid Mechanics - I	3	1	-	3	30	70	100
3	CE2203	PCC	Structural Analysis - I	4	1	-	3	30	70	100
4	CE2204	PCC	Environmental Engineering - I	3	1	-	3	30	70	100
5	CE2205	PCC	Geotechnical Engineering - I	3	-	-	3	30	70	100
6	CE2206	OEC	**Open Elective-I** Managerial Economics	3	-	-	2	30	70	100
7	CE2207	PCC	Building Planning and Design	-	1	2	2	30	70	100
8	CE2208	PCC	Total Station and Geomatics Lab	-	-	3	1.5	50	50	100
9	CE2209	PCC	Fluid Mechanics Lab-I	-	-	3	1.5	50	50	100
			Total	**19**	**4**	**8**	**22.0**	**310**	**590**	**900**

Department of Civil Engineering
SCHEME OF INSTRUCTION & SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

III Year - I Semester

S.No	Sub Code	Category	Subject Name	L	T	P	C	I	E	TM
1	CE3101	PCC	Structural Analysis - II	3	1	-	3	30	70	100
2	CE3102	PCC	Environmental Engineering-II	3	1	-	3	30	70	100
3	CE3103	PCC	Reinforced Concrete Structures - I	4	1	-	3	30	70	100
4	CE3104	PCC	Steel Structures - I	4	1	-	3	30	70	100
5			**Professional Elective - I**	3	-	-	3	30	70	100
	CE3105A	PEC	Concrete Technology							
	CE3105B	PEC	Remote Sensing and GIS Applications							
	CE3105C	PEC	Geo-Environmental Engineering							
6	CE3106	OEC	**Open Elective - II** Building Services and Maintenance	3	-	-	2	30	70	100
7	CE3107	PCC	Geotechnical Engineering Lab - I	-	-	3	1.5	50	50	100
8	CE3108	PCC	Environmental Engineering Lab	-	-	3	1.5	50	50	100
			Total	**20**	**4**	**6**	**20.0**	**280**	**520**	**800**

III Year - II Semester

S.No	Sub Code	Category	Subject Name	L	T	P	C	I	E	TM
1	CE3201	PCC	Estimation, Specifications and Contracts	3	1	-	3	30	70	100
2	CE3202	PCC	Fluid Mechanics -II	4	1	-	3	30	70	100
3	CE3203	PCC	Reinforced Concrete Structures - II	3	1	-	3	30	70	100
4	CE3204	PCC	Transportation Engineering	4	1	-	3	30	70	100
5	CE3205	PCC	Water Resources Engineering-I	3	1	-	3	30	70	100
6			**Professional Elective - II**	3	-	-	3	30	70	100
	CE3206A	PEC	Steel Structures- II							
	CE3206B	PEC	Ground Improvement Techniques							
	CE3206C	PEC	Irrigation Engineering							
7	CE3207	PCC	Highway Material Lab	-	-	3	1.5	50	50	100
8	CE3208	PCC	Concrete Lab	-	-	3	1.5	50	50	100
9	CE3209	PCC	Computer Applications in Civil Engineering Lab	-	1	2	1.5	50	50	100
			Total	**20**	**6**	**8**	**22.5**	**330**	**570**	**900**

Department of Civil Engineering
SCHEME OF INSTRUCTION & SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)
IV Year - I Semester

S.No	Sub Code	Category	Subject Name	L	T	P	C	I	E	TM
1	CE4101	PCC	Geotechnical Engineering - II	3	1	-	3	30	70	100
2	CE4102	PCC	Fluid Mechanics - III	3	1	-	3	30	70	100
3	CE4103	PCC	Water Resources Engineering-II	3	-	-	3	30	70	100
4	CE4104	PCC	Construction Management	3	-	-	3	30	70	100
5			**Professional Elective - III**	3	-	-	3	30	70	100
	CE4105A	PEC	Prestressed Concrete Structures							
	CE4105B	PEC	Elements of Coastal Engineering							
	CE4105C	PEC	Introduction to Rock Mechanics							
	CE4105D	PEC	Solid Waste Management							
6			**Professional Elective - IV**	3	-	-	3	30	70	100
	CE4106A	PEC	Environmental Impact Assessment							
	CE4106B	PEC	Earth Retaining Structures							
	CE4106C	PEC	Airport Planning and Design							
	CE4106D	PEC	Finite Element Method of Analysis							
7	CE4107	PCC	Geotechnical Engineering Lab - II	-	-	3	1.5	50	50	100
8	CE4108	PCC	Fluid Mechanics Lab-II	-	-	3	1.5	50	50	100
			Total	18	2	6	21.0	280	520	800

IV Year - II Semester

S.No	Sub Code	Category	Subject Name	L	T	P	C	I	E	TM
1	CE4201	PW	Project Work	-	-	12	12.5	100	100	200
			Total	-	-	12	12.5	100	100	200

Department of Civil Engineering
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

SUMMARY OF CREDITS SEMESTER WISE

I B. Tech. I Semester	19.0
I B. Tech. II Semester	20.0
II B. Tech. I Semester	23.0
II B. Tech. II Semester	22.0
III B. Tech. I Semester	20.0
III B. Tech. II Semester	22.5
IV B. Tech. I Semester	21.0
IV B. Tech. II Semester	12.5
TOTAL CREDITS	160.0

II Year – I Semester

CE2101   MATHEMATICS –IV

Vector Calculus-1: Differentiation of vectors, curves in space, velocity and acceleration, relative velocity and relative acceleration, scalar and vector point functions, vector operator ∇ applied to scalar point functions– gradient, ∇ applied to vector point functions– divergence and curl. Physical interpretation of ∇f, $\nabla . \overline{F}$, $\nabla \times \overline{F}$, ∇ applied twice to point functions, ∇ applied to products of two functions; Irrotational and Solenoidal fields.

Vector Calculus-2: Integration of vectors, line integral, circulation, work done, surface integral-flux, Green's theorem in the plane, Stoke's theorem, volume integral, Gauss Divergence theorem.

Introduction of orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates

Introduction Of Partial Differential Equations: Formation of partial differential equations, solutions of partial differential equations– equations solvable by direct integration, linear equations of first order: Lagrange's Linear equation, non-linear equations of first order, Charpit's method.

Homogeneous linear equations with constant coefficients– rules for finding the complementary function, rules for finding the particular integral (working procedure), non- homogeneous linear equations.

Applications of Partial Differential Equations: Method of separation of variables, One dimensional wave equation–vibrations of a stretched string, one dimensional Heat equation, Two dimensional heat flow in steady state – solution of Laplace's equation in Cartesian and polar coordinates (two dimensional).

Integral Transforms: Introduction, definition, Fourier integral, Sine and Cosine integrals, Complex form of Fourier integral, Fourier transform, Fourier Sine and Cosine transforms, Finite Fourier Sine and Cosine transforms, properties of Fourier transforms, Convolution theorem for

Fourier transforms, Parseval's identity for Fourier transforms, Fourier transforms of the derivatives of a function, simple applications to Boundary value problems.

Text Books
1. *Higher Engineering Mathematics by Dr. B.S.Grewal, Khanna Publishers.*

Reference Books
1. *A Text Book of Engineering Mathematics by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.*
2. *Mathematical Methods of Science & Engineering aided with MATLAB by Kanti B.Dutta, Cengage Learning India Pvt. Ltd.*
3. *Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Publication .*
4. *Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Co. Ltd.*
5. *Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.*
6. *Higher Engineering Mathematics by Dr. M.K.Venkataraman, The National Publishing Company.*

CE2102   ENGINEERING GEOLOGY

General geology:

Importance of geology from Civil Engineering point of view. Weathering and soils: soil profile, erosion, and soil formation, types of Indian soils.

Landforms produced by running water, glaciers, wind, sea waves and currents.

Ground water: Origin and Occurrence of ground water. Porosity and permeability. Aquifers and ground water moment and water bearing properties of rocks.

Petrology & Mineralogy:

Petrology: Definitions of rock. Rock classification, structure, texture and mineralogical composition. Types of rocks– ingenious rocks and structures-dykes and sills: granite, dolerite, basalt.

Sedimentary rocks: conglomerate, sandstone, shale, limestone.

Metamorphic rocks: gneiss, khondalite, schist, marble, charnokite, engineering properties of rocks.

Mineralogy: Physical properties: form, colour. lustre, cleavage, fracture, hardness and specific gravity. Study of important rock forming minerals: fledspar, micas and clays

Stratigraphy and Structural Geology:

Stratigraphy: major geological formations of India. Archaeans. Cuddapahs, vindyana, gondwanas and deccan traps.

Mineral resources of Andhra Pradesh. Structural geology: elements of structural geology–strike and dip, plunge. Clinometers compass and Brunton compass. Classification of folds, faults and joints. Geological methods of investigation: geological formations, preparations of geological maps, structural features and groundwater parameters.

Natural hazards: earthquake origin and distribution. Volcanoes, landslides and mass moment. Tsunamis.

Remote Sensing and Geo Physical Methods:

Remote sensing: Introduction, electromagnetic spectrum, aerial photo, types of aerial photos and flight planning aerial mosaics. Elements of photo interpretation. Satellite, remote sensing, Satellite, sensors and data products, principles of GIS. RS and GIS applications to Civil Engineering–town planning, dams and reservoirs,

Geophysical Methods:

Principles of geophysical methods, electrical methods, seismic methods. Principles of resistivity method and configurations. Applications of resistivity method in prediction of soil profile, hard rock and ground water table. principles of seismic refraction and reflections methods and their applications to Civil Engineering problems.

Geological applications to Civil Engineering structures: Role of engineering geologists in planning, design and construction stages in Civil Engineering works. Geological investigations for dams and reservoir; geological investigations for bridges and multi-storied structures. geological investigation for highways. Geological investigations for tunnels and coastal structures. (sea walls. groins and bulkheads). Environmental geology.

Text Books

1. *Principles of Engineering Geology by K.V.G.K.Gokhale. B.S. Publications-2005*
2. *Engineering Geology by N.Chennakesavalu, Mc-Millan, Indian Ltd-2005*
3. *A Text Book of Geology by P.K.Mukherjee, World Press*
4. *Engineering and General Geology by Parbin Singh, Katson Publishing House*
5. *Fundamentals of Remote Sensing by George Jospeh, University Press (India) Private Ltd.*

CE2103   MECHANICS OF MATERIALS

Duties/Obligations Accountability of Structural Engineer for the Design of a Structure: a) Economy b) Safety: (i) Strength Consideration (ii) Stiffness Consideration. Need for Assessment of Strength of a Material – Analysis for Strength Requirement for Design Purposes – Review of IS Code Provisions.

Effects of Force: Tension, Compression and Shear. Stress as Internally Elastic Resistance of a Material – Strain – Property of Elasticity – Hooke's Law – Stress-Strain Diagrams. Characteristic Strengths, Factors of Safety and Working Stresses for Materials and Various Types of Application of Load. Elastic Strain – Energy, Stress due to Gradually Applied Load, Sudden Load, Impact Load and Shock Load. Lateral Strain, Poisson's Ratio. Complementary Shear Stress, Shear Strain, Shear Modulus. Relation Between Modulus of Elasticity, Modulus of Rigidity and Bulk Modulus. Stresses in Composite Assemblies due to Axial Load and Temperature Change.

Effect of Transverse Force, Shear Force, Bending Moment and Axial Thrust Diagrams for A) Cantilever B) Simply Supported and C) Over Hanging Beams for various patterns of Loading. Relation between (i) Intensity of Loading (ii) Shear Force and (iii) Bending Moment at a Section. Theory of Simple Bending: Flexural Normal Stress Distribution; Flexural Shear Stress Distribution for Various Shapes of Cross Section.

Deflections of Beams: (i) Cantilever (ii) Simply Supported and (iii) Over Hanging Beams, using (a) Double Integration and (b) Macaulay's Method.

Stresses on Oblique Plane – Resultant Stress – Principal Stress and Maximum Shear Stress and Location of their Planes. Mohr's Circle for Various Cases of Stresses; Theory of Pure Torsion

for Solid and Hollow Circular Sections – Torsional Shear Stress Distribution, Effect of Combined Torsion, Bending and Axial Thrust – Equivalent B.M and T.M.

Longitudinal and Hoop stresses in Thin Cylinders subjected to Internal Pressure. Wire Wound Thin Cylinders.

Columns and Struts: Combined Bending and Direct Stresses – Kern of a Section – Euler's Theory – End Conditions. Rankine-Gordon Formula – Eccentrically Loaded Columns. Open and Closed Coiled Helical Springs subjected to Axial Load.

Text books

1. *Strength of materials by S.Ramamrutham and R.Narayana, Dhanpat Rai Publishing Company, New Delhi.*

2. *Mechanics of Materials by B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Lakshmi Publications.*

3. *Analysis of Structures, Vol. I, 1993 edition, by V.N.Vazirani and M.M.Ratwani, Khanna Publishers Books.*

Reference Books

1. *Strength of Materials (Elementary Theory and Problems) by S.Timoshenko and D.H.Young, CBS Publishers & Distributors Pvt. Ltd.*

2. *Introduction to Mechanics of Solids by Popov, Prentice-Hall.*

3. *Strength of Materials by Hyder, Universities Press.*

4. *Elementary Mechanics of Solids by P.N. Singer and P.K.Jha, New Age International Publishers.*

CE2104   SURVEYING – I

Introduction: Classification and Principles of Surveying, Triangulation and Trilateration – Earth as Spheroid, Datum, Geoid, Azimuth, Latitude, Longitude, Map Projections, Scales, Plans and Maps. Chain Surveying: Instrumentation for Chaining – Errors due to Incorrect Chain–Chaining on uneven and sloping Ground – Errors in Chaining –Tape Corrections – Problems: Base Line

Measurement – Chain Triangulation – Check Lines, Tie Lines, Offsets. Basic Problems in Chaining – Obstacles in Chaining – Problems – Conventional Signs.

Compass Survey: (a) Introduction to Compass Survey Definitions of Bearing. True bearing, True meridian, Magnetic Meridian, Magnetic Bearing – Arbitrary Meridian, R.B & B.B of Lines – Designation of Bearing – W.C.B. & R.B. – Conversion of Bearings from one system to the other – Related Problems – Calculation of Angles for Bearings, Calculation of Bearings for Angles, Related Problems – Theory of Magnetic Compass (i.e. Prismatic Compass) – Magnetic Dip – Description of Prismatic Compass. Temporary Adjustments of Compass – Magnetic Declination – Local Attraction – Related Problems – Errors in Compass Survey.

(b) Traverse Surveying: Chain and Compass Traversing – Free or Loose Needle Method – Fast Needle Method – Checks in Closed and Open Traverse – Plotting Methods of Traverse Survey – Closing Error – Balancing the Traverse – Bowditch's Method –Transit Method, Gale's Traverse Table.

Plane Table Surveying: Introduction – Advantages, Accessories – Working Operations such as Fixing the Table to Tripod, Leveling – Centering – Orientation by Back – Sighting. Methods of Plane Tabling – Plane Table Traversing – Three Point Problem – Mechanical Method – Graphical Method – Two Point Problem – Errors in Plane Tabling.

Levelling: Definitions of Terms – Methods of Levelling – Uses and Adjustments of Dumpy Level – Temporary and Permanent Adjustments of Dumpy Level Levelling Staves – Differential Levelling, Profile Levelling – Cross Sections – Reciprocal levelling. Precise Levelling – Definition of BS, IS, FS, HI, TP – Booking and Reduction of Levels, H.I. Methods – Rise and Fall Method – Checks – Related Problems – Curvature and Refraction Related Problems – Correction – Reciprocal Levelling – Related Problems – L.S & C.S Leveling – Problems in Levelling – Errors in Levelling.

Minor Instruments: Uses and Adjustments of the following Minor Instruments: Line Ranger, Optical Square, Abney Level and Clinometer, Ceylon Ghat Tracer, Pentagraph, Sextant and Planimeter.

Contouring: Definitions – Contour Intervals, Characteristics of Contours – Methods of Locating Contours – Direct and Indirect methods – Interpolation of Contours – Contour Gradient – Uses of Contour Maps. Contours Mapping using Computer Techniques (Surfer, CAD).

Text Books

1. *Surveying Vol. I, II and III by B.C.Punmia, Standard Book House.*
2. *Surveying Vol. I, II and III by K.R. Arora, Standard Book House.*

Reference Books

1. *Surveying Vol. I and II by S.K. Duggal, Tata McGraw-Hill Publishing Co. Ltd.*
2. *Surveying: Theory & Practices by James M. Anderson and Edward M. Mikhail, Tata McGraw-Hill Publishing Co. Ltd.*
3. *Advanced Surveying by Satheesh Gopi, Sathikumar and Madhu, Pearson India.*
4. *Geomatics Engineering by M.K.Arora and R.C.Badjatia, Nemchand & Bros.*

CE2105   ENGINEERING MECHANICS

Basic Concepts: Introduction to Engineering Mechanics – Scalar and Vector quantities – Forces – Characteristics of a Force – Definitions and Examples of Various Types of Force Systems – Definition of Resultant – Composition and Resolution of Forces – Moment of a Force – Principles of Moments of Force – Couples – Characteristics of a Couple – Transformations of a Couple – Resolution of a Force into a Force and Couple.

Resultants of Force Systems, Possible Resultants of Different Types of Force Systems – Resultant of a Concurrent, Coplanar Force System – Resultant of a Non-concurrent Coplanar Force System – Resultant of a Concurrent Non-coplanar Force System – Resultant of a Parallel, Non-coplanar Force System – Resultant of a System of Couples in Space – Resultant of Non-concurrent, Non-coplanar, Non-parallel Force System – Screw of Wrench.

Equilibrium: Free Body Diagrams – Equations of Equilibrium for a Concurrent Coplanar Force System – Equilibrium of Bodies Acted on by Two or Three Forces – Equilibrium of Bodies Acted on by Non-concurrent Coplanar Force System – Equilibrium of Bodies Acted on by Parallel, Non-coplanar Force System – Equilibrium of Non-concurrent, Non-coplanar Non-Parallel Force System.

Analysis of Statically Determinate Trusses by (a) Method of Joints and (b) Method of Sections.

Centroids and Centres of Gravity: Centre of Gravity of Parallel Forces in a Plane – Centre of Gravity of Parallel Forces in Space – Centroid and Centre of Gravity of Composite Bodies – Theorems of Pappus – Distributed Loads on Beams.

Moments of Inertia, Definition – Parallel Axis Theorem for Areas – Second Moments of Areas by Integration – Radius of Gyration of Areas – Moments of Inertia of Composite Areas – Parallel Axis and Parallel Plane Theorems for Masses – Moments of Inertia of Masses by Integration – Radius of Gyration of Mass – Moments of Inertia of Composite Masses.

Friction: Nature of Friction – Laws of Friction – Coefficient of Friction – Angle of Friction – Cone of Friction – Problems Involving Frictional Forces

Method of Virtual Work: Principle of Virtual Work – Equilibrium of Ideal System – Stability of Equilibrium.

Kinematics: Absolute Motion: Introduction – Recapitulation of Basic Terminology of Mechanics – Newton's Laws – Introduction to Kinematics of Absolute Motion – Rectilinear Motion of a Particle – Angular Motion – Curvilinear Motion of a Particle using Rectangular Components – Motion of Projectiles – Curvilinear Motion using Radial and Transverse Components – (Simple Problems only) – Basics of Simple Harmonic Motion (Simple Problems) – Motion of Rigid Bodies.

Kinematics: Relative Motion: Introduction to Kinematics of Relative Motion – Relative Displacement – Relative Velocity – Instantaneous Centre – Relative Acceleration.

Kinetics: Introduction to Kinetics – Newton's Laws of Motion – Equation of Motion for a Particle. Motion of the Mass Centre of a System of Particles – D'Alembert's Principle – Rectilinear Translation of a Rigid Body – Curvilinear Translation of a Rigid Body – Rotation of a Rigid Body – Plane Motion of a Rigid Body.

Kinetics: Work and Energy Approach – Work Done by a Force – Work Done by a Couple – Work Done by a Force System – Energy: Potential Energy – Kinetic Energy of a Particle – Kinetic Energy of a Rigid Body – Principle of Work – Energy and Application to Particle and Rigid Body in Planar Motion – Conservation of Energy

Impulse – Momentum Approach – Linear Impulse – Linear Momentum – Principle of Linear Impulse and Linear Momentum – Conservation of Linear Momentum – Elastic Impact - Principle of Angular Momentum.

Text Books

1. *Engineering Mechanics by Fredinand Leon Singer, B.S.Publications.*
2. *Applied Mechanics by I.B. Prasad, Khanna Publishers.*

Reference Books

1. *Engineering Mechanics by S.Timoshenko and D.H. Young, Tata McGraw-Hill Publishing Co. Ltd. India.*
2. *Engineering Mechanics Vol. I and Vol. II by J.L.Meriam and L.G.Kraige, Wiley Publications.*
3. *Mechanics for Engineers Statics and Dynamics by F.B. Beer and E.R. Johnston.*
4. *Engineering Mechanics by R.S.Kurmi, S.Chand Publishing.*

CE 2106   BUILDING MATERIALS AND BUILDING CONSTRUCTION

Masonry: Different Types of Stone Masonry – Plan, Elevation, Sections of Stone Masonry Works – Brick Masonry – Different Types of Bonds – Plan, Elevation and Section of Brick Bonds up to Two-Brick Wall Thickness – Partition walls – Different Types of Block Masonry – Hollow Concrete Blocks – FAL-G Blocks, Hollow Clay Blocks.

Foundations: Types of Foundations: Strip, Isolated, Strap, Combined Footings, Raft – Mat – Slab and Beam Raft, Box Type Raft, Inverted Arch Foundations, Shell Foundations, Grillage Foundations – Minimum Depth of Foundation – Bearing Capacity of Soils.

Paints, Varnishes: Paints and Varnishes: Constituents and Characteristics of Paints, Types of Paint, their uses and preparation on Different Surfaces, Painting Defects, Causes and Remedies. Constituents of Varnishes, Uses of Varnishes, Different Kinds of Varnishes, Polishes. Painting of Interior Walls, Exterior Walls, Wooden Doors and Windows – Steel Windows – Various Types of Paints (Chemistry of Paints not included) Including Distempers; Emulsion Paints etc., Varnishes Wood Work Finishing Types.

Asbestos, Asphalt Bitumen and Tar: Availability and uses of Asbestos, Properties of Asbestos, Various Types of Asbestos, Difference Between Asphalt and Bitumen, Types, Uses and

Properties of Asphalt and Bitumen, Composition of Coal Tar, Wood Tar, Mineral Tar and Naphtha.

Roofing: Mangalore Tiled Roof, RCC Roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre Glass, Aluminium, G.I. Sheet Roofings.

Trusses: King Post and Queen Post Trusses – Steel Roof Truss for 12 m Span with details.

Wooden Doors and Windows: Parallel – Glazed – Flush Shutters, Plywood, Particle Board Shutters – Aluminum, PVC, Steel Doors, Windows and Ventilators, various types of Windows, Glazing – Different Varieties.

Stair Cases: Stair Cases or Stairway Design (Architectural Design or Planning only) various types such as, Straight Flight, Dog-legged, Quarter Landing, Open Spiral, Spiral Stairs etc.

Concrete Technology and Mix Design: Polymer Concrete, Types of Cement Concretes, Ingredients and their Characteristics, Cement Concrete Properties and Relevant Tests, Storage, Batching, Mixing and Transporting, Placing, Vibrating and Curing. Concrete Grades and Mix Designs up to M30 as per IS Code. Introduction to Polymer Concrete and its applications.

Text Books

1. *Engineering Materials [Material Science] by Rangwala, Charotar Publications.*
2. *Concrete Technology Theory & Practice by M.S. Shetty, S. Chand & Company Ltd.*
3. *Building Construction by B.C. Punmia,. Laxmi Publications.*
4. *Civil Engineering Construction Materials, S.K. Sharma, KBP House.*

Reference Books

1. *Concrete: Microstructure, Properties & Materials, PK Mehta, Tata McGra-Hill Publications.*
2. *Building Construction, Vol.II & III By W.B. Mckay, E.L.B.S. and Longman, UK.*
3. *Building Materials by S.K. Duggal, New Age International Publishers.*
4. *Construction Technology by R. Chudly Vols I & II, 2nd Edition, Longman, UK.*

CE2107 ENVIRONMENTAL STUDIES

Chapter 1- Introduction: Definition, Scope and importance of environmental studies; Types, Characteristic features, Structure and functions of eco systems- Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries).
Chapter 2 - Environment and Natural Resources management: Land Resources: Land as a resource, Common property resources, land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer pesticide problems, utilization of surface and ground water, Floods, Droughts, Water logging and salinity, Dams-benefits and costs, Conflicts over water. **Chapter 3 - Bio-Diversity and its Conservation:** Value of bio-diversity-Consumptive and productive use, Social, Ethical, Aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to biodiversity- Hot spots, habitat loss, poaching of wildlife, loss of species, seeds etc., Conservation of biodiversity;– in- situ and ex-situ conservation.**Chapter 4 - Environmental Pollution – Local and Global Issues:** Causes, Effects and control measures of : Air pollution, Indoor air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Solid waste management, Compositing, Urban and industrial wastes, Recycling and re-use, nuclear hazards, Global warming, Acid rain Ozone depletion. **Chapter 5 - Social Issues and the Environment:** Population growth and environment, Environmental education, Environmental movements, Environment Vs development; **Institutions and Governance-**Regulation by Government, Monitoring and enforcement of environmental regulation; **International Conventions-**Stockholm Conference 1972, Earth Summit 1992, World Commission for Environmental Development (WCED) **Chapter 6 - Case Studies:** Chipko movement, Narmada Bachao Andolan, Silent valley project, Taj Majal, Tehri Dam, Ralegaon Siddhi (Anna Hazare), Kolleru lake- Aquiculture, Florosis in Andhra Pradesh.
Activities: Plantations, Gifting a sapling to see its full growth, Cleanliness drive, Drive for segregation of waste, shutting down the fans and ACs of the campus for an hour or so. Visit to a local area to document and mapping environmental assets – River / forest / grassland / hill / mountain, Study of local environment – Common plants, Insects, Birds, Study of simple ecosystems – Pond, river, hill slopes etc. Visits to Industries, Water treatment plants, Effluent treatment plants.
Text book:
1. Dr. D. K. Asthana and Dr. Meera Asthana: A Textbook of Environmental Studies, S. Chand, NEW Delhi, 2019.
2. B. K. Sharma and H. Kaur: An Introduction to Environmental Pollution, Goal Publishing House, MEERUT, 2015.

CE2108   MATERIALS, TESTING AND EVALUATION LABORATORY

(1) Tension Test on Mild steel/HYSD bars
(2) Compression Test on Wood (Parallel and Perpendicular to Grains)
(3)   Tests on Springs for the Determination of Rigidity Modulus and Spring Constant
(4) Brinell's and Rockwell Hardness Tests
(5) Charpy and Izod Impact Tests
(6) Double Shear Test on Mild Steel Specimen
(7) Bending Test: Load Deflection Test for the Determination of Young's Modulus on Simply Supported and Cantilever Beams of Wood and Steel
(8) Buckling of Wooden Column

CE2109 SURVEYING FIELD WORK

Chain Surveying: Introduction of Instruments used for Chain Survey, Folding and Unfolding of Chain – Line Ranging (Direct Method) – Pacing. Chain Traversing – Preparation of Plan of a Residential Building by making use of Chain, Ranging Rods, Oblique Off – Set Method, Introduction of Check Line. Preparation of Residential Building by Perpendicular Offset, Introduction of Tie Lines. Finding the Distance between Inaccessible Points by making use of Chain, Cross Staff, Tape, Ranging Rods; Arrows and Field Problems of Obstacles to Chaining.
Compass Survey: Introduction to Prismatic Compass – Temporary Adjustments. Finding the Distance Between Inaccessible Points by Making use of Compass, Tape and Ranging Rods. Compass Traversing – Plotting of a Residential Building.
Plane Table Survey: Introduction to Plane Table – Use of its Accessories: Two and Three Point Problem. Finding the Distance between Inaccessible Points by Making use of Plane Table, Accessories – Ranging Rods and Tape.
Levelling: Introduction to Dumpy Level, Levelling Staff. Reading of Level Staff, Temporary Adjustments of Dumpy Level. Introduction to Fly Levelling – Booking the Readings by Height of Collimation Method. Introduction to Fly Levelling–Booking the Readings by Rise and Fall Method – To Find Closing Error. Check Levelling – L.S. and C.S. of a Road Profile.
Preparation of Contour Plan for an Open Area by taking Level of the Site.

Department of Civil Engineering
SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

II Year – II Semester

CE2201   SURVEYING – II

Theodolite – Types of Theodolites – Temporary Adjustments, Measurements of Horizontal Angle – Method of Repetition, Method of Reiteration – Uses of Theodolites – Errors in Theodolite or Permanent Adjustments of a Theodolite – Identification – Rectifying the Errors.

Theodolite Traversing – Open and Closed Traverse – Closing Errors, Balancing the Error – Bowditch Method – Transit Method, Omitted Measurements – Gale's Traverse Table or Trigonometric Levelling – Elevation of Top of the Tower – Same Plane – Different Planes.

Tacheometry – Principle of Tachometry – Stadia Methods – Fixed Hair Method – Movable Hair Method – Tangential Method – Subtense Bar – Beaman's Stadia, Arc – Reduction Diagrams or Triangulation – Classification – Intervisibility of Station – Signals and Towers – Base Line Measurements – Corrections – Satellite Station and Reduction to Centre – Basenet.

Curves – Sample Curves – Elements of Simple Curves – Methods of Setting Simple Curves – Rankine's Method – Two Theodolite Method – Obstacles in Curve Setting – Compound Curves – Elements of Compound Curves or Reverse Curves – Elements of Reverse Curve – Determination of Various Elements – Transition Curves – Ideal Shape – Spiral Transition Curves – Length of Transition Curve – Setting Out Methods.

Total Station Surveying: Electronic Theodolite, Electronic Distance Measurements, Total Station, Errors in Measurements, Advantages, Disadvantages, Applications; Contour Mapping, Determination of Height of Remote Point, Position of Hidden Point, Free Station, Area Measurement, Volume Measurement.

Modern Surveying and Mapping: GPS Survey – Introduction, Errors in GPS, Positioning Methods, Classification of GPS Surveying, Applications, Advantages and Disadvantages, Photogrammetric Surveying; Sensors and Platforms, Aerial Photogrammetry, Satellite Images Resolution, Concept of Stereo Models, Photogrammetric Products, Rectified Images,

Orthophotography, Topographic Map, Digital Maps, DEM, GIS, Advantages and Disadvantages of Photogrammetric Surveying.

Text Books

1. *Surveying Vol. I, II and III by B.C.Punmia, Standard Book House.*
2. *Surveying by Dr. K.R. Arora, Standard Book House.*

Reference Books

1. *Surveying Vol. I and II by S.K. Duggal, Tata McGraw-Hill Publishing Co. Ltd.*
2. *Principles of GIS for Land Resource Assessment by P.A. Burrough, Clerendon Press, Oxford.*
3. *Surveying: Theory and Practices by James M. Anderson and Edward M. Mikhail, McGraw-Hill Education.*
4. *Advanced Surveying by Satheesh Gopi, Sathikumar and Madhu, Pearson India.*
5. *Geometric Engineering by Arora and Badjatia, Nemchand and Co.*

CE2202   FLUID MECHANICS – I

Fluid Properties and Fluid Statics: Introduction & Physical Properties of Fluids – Definition of Fluid, Fluid as Continuum; Mass Density, Specific Weight, Specific Gravity, Specific Volume, Bulk Modulus, Compressibility, Vapour Pressure, Cavitation, Viscosity – Newton's Law of Viscosity, Rheological Diagram ; Capillarity and Surface Tension.

Fluid Statics, Pressure and its Measurement – Forces acting on a Fluid Element – Pascal's law; Variation of Pressure in Static Fluid; Absolute, Gauge and Total Pressure; Pressure Measurement – Piezometers, Manometers, Micro-manometers, Mechanical Gauges and Pressure Transducers.

Forces on Immersed Bodies in Static Fluids – Force on a Plane Surface – Centre of Pressure; Pressure Diagram; Forces on Curved Surfaces; Forces on Radial Crest Gates and Lock Gates.

Buoyancy and Floatation – Archimedes Principle; Stability of Floating Bodies – Centre of Buoyancy, Metacentric Height and its determination.

Fluid Kinematics and Conservation of Mass: Types of Fluid Flow & Methods of Fluid Flow Analysis – Methods of Describing Fluid Motion; Types of Flow – Steady and Unsteady Flows, Uniform and Non-uniform Flows, free and forced vortex motions, Laminar and Turbulent Flows; Streamline, Path line, Streak line; Stream Surface – Stream Tube.

Fluid Kinematics – Translation, Deformation and Rotation of a Fluid Element in Motion; Local, Convective and Total Accelerations; One, Two and Three Dimensional Analysis of Flows.

Ideal Fluid Flow – Stream Function, Velocity Potential; Rotational & Irrotational Flows – Vorticity and Circulation; Laplace Equation in terms of Stream Function and Velocity Potential; Flow Nets.

Principle of Conservation of Mass – Concepts of System and Control Volume; Continuity Equation in three dimensional Cartesian coordinates; Continuity Equation for flow through a Stream tube.

Fluid Dynamics: Principle of Conservation of Energy – Equation of Motion for Ideal Fluids, Euler's Equation in Streamline Coordinates, Derivation of Energy Equation through integration of Euler's Equation, Bernoulli's Equation, Energy Correction Factor. Flow measuring devices – Flow Measurement in Pipes – Measurement of Static, Stagnation and Dynamic Pressures and Velocity – Pitot Tube, Prandtl Pitot Tube; Measurement of Discharge through a Pipe using Flow Meters – Venturimeter, Flow Nozzle meter and Orifice meter.

Flow through Tanks and Reservoirs – Measurement of Discharge from Tanks and Reservoirs – Steady and Unsteady Flow through Orifices and Mouthpieces – Small & Large Orifices – Different types of Mouthpieces; Discharge from tanks through Drowned Orifices, Time of Emptying Tanks, Discharge from a Tank with Inflow.

Flow Measurement in Channels – Flow Measurement in Open Channels, Flow Past Weirs and Notches, Sharp Crested and Broad Crested Weirs, Weirs with and without end contractions, Ventilation of Weirs, Triangular Notches, Cipolletti Weir.

Principle of Conservation of Momentum – Momentum of Fluids in Motion, Impulse Momentum Equation, Momentum Correction Factor. Application of Momentum Principle – Forces on Pipe Bends and Reducers, Flow through a Nozzle; Angular Momentum of Fluid Flow – Sprinkler Problems.

Laminar flow: Equation of Motion for Real Fluids – Modifications in Equation of Motion, Stress Strain Relationships, Tangential Stress Terms.

Steady Flow between Parallel Plates, Couette's and Poiseuille's Flows; Axisymmetric Flows, Flow without and with Pressure Gradient – Hagen-Poiseuille Equation; Relationship between Friction factor and Reynolds Number for Laminar Flow through Pipes; Stokes' law.

Text Books
1. *Fluid Mechanics and Hydraulic Machinery by P.N.Modi and S.M. Seth, Standard Book House.*
2. *Fluid Mechanics by A.K.Jain, Khanna Publishers.*

Reference Books
1. *Engineering Fluid Mechanics by K.L.Kumar, S. Chand & Co. Ltd.*
2. *Engineering Hydraulics, H.Rouse, John Wiley & Sons Inc.*
3. *Mechanics of Fluids, I.H.Shames,McGraw-Hill Professional.*

CE2203   STRUCTURAL ANALYSIS – I

Deflections of Beams Using (i) Moment Area Method, (ii) Conjugate Beam Method, (iii) Unit Load Method (iv) Castigliano's Theorem – 1.

Strain – Energy due to (i) Axial Load, (ii) Shear Force, (iii) Bending Moment and (iv) Torque; Deflections of Statically Determinate Structures: (A) Single Storey, Single Bay Rectangular Portal Frames using (i) Unit Load Method, (ii) Castigliano's Theorem –1. (B) Trusses (Having 9 Members or less) using (i) Unit Load Method and (ii) Castigliano's Theorem-1.

Analysis of (A) Fixed Beams, (B) Three Span Continuous Beams using (i) Theorem of Three Moments, (ii) Slope Deflection Method and (iii) Moment Distribution Method

Moving Loads: Maximum Shear Force and Bending Moment Diagrams for Different types of Loads. Maximum Bending Moment at a Section under a Wheel Load and Absolute Maximum Bending Moment in the case of several Wheel Loads. Equivalent Uniformly Distributed Live Load for Shear Force and Bending Moment. Reversal of Nature of Shear Force, Focal Length, Counter Bracing for Truss Panels, Influence Lines for (i) Beams and (ii) Members of Warren and Pratt Trusses.

Thick Cylinders –Lamme's Theory, Compound Tubes – Theory of Failure (i) Principal Stress Theory, (ii) Principal Strain Theory, (iii) Maximum Shear Stress Theory and (iv) Maximum Strain Energy Theory.

Text books

1. *Theory of Structures, Vol- I, by G.S.Pundit, S.P.Gupta and R.Gupta,, McGraw-Hill Education India.*

2. *Mechanics of structures Vol- I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House.*

3. *Strength of Materials by S.Ramamrutham and R.Narayanan, Dhanpat Rai Publishing House.*

Reference Books

1. *Elementary Strength of Materials by S.Timoshenko and D.H.Young, Affiliated East-West Press.*

2. *Analysis and Design of Structures Vol-I by V.N.Vazirani and M.M.Ratwani, Khanna Publishers.*

3. *Intermediate Structural Analysis by C.K.Wang, McGraw-Hill.*

4. *Strength of Materials by B.C.Punmia, Laxmi Publications.*

CE2204   ENVIRONMENTAL ENGINEERING – I

Introduction: Importance and Necessity of Protected Water Supply systems, Objectives of Protected Water Supply System, Flow Chart of Public Water Supply System, Role of Environmental Engineer, Agency Activities.

Water Demand and Quantity Studies: Estimation of Water Demand for a town or city, Types of Water Demands, Per Capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design Period, Population Studies, Population Forecasting Studies.

Hydrological Concepts: Hydrological Cycle, Types of Precipitation, Measurement of Rainfall. Surface Sources of Water: Lakes, Rivers, Impounding Reservoirs, Capacity of Storage Reservoirs, Mass Curve Analysis. Groundwater Sources of Water: Types of Water bearing

formations, Springs, Wells and Infiltration Galleries, Yields from Wells and Infiltration Galleries.

Collection of Water: Factors Governing the Selection of the Intake Structure, Types of Intakes. Conveyance of Water: Gravity and Pressure Conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of Pipe Lines, Laying of Pipe Lines.

Quality and Analysis of Water: Characteristics of water – Physical, Chemical and Biological. Analysis of Water: Physical, Chemical and Biological. Impurities in Water, Water Borne Diseases. Drinking Water Quality Standards.

Treatment of Water: Flowchart of Water Treatment Plant, Treatment Methods (Theory and Design) – Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Chlorination and other Disinfection methods, Softening of Water, Defluoridation, Removal of Odours.

Distribution of Water: Methods of Distribution System, Components of Distribution System, Layouts of Distribution Networks, Pressures in the Distribution Layouts, Analysis of Distribution Networks, Water Connection to the Houses.

Text Books

1. *Environmental Engineering by Peavy, Rowe, Tchenobolus. McGraw-hill Pub.*
2. *Elements of Environmental Engineering by K.N. Duggal, S.Chand & Company Pvt. Ltd.*

Reference Books

1. *Environmental Engineering Vol. I: Water Supply Engineering by S.K. Garg, Khanna Publishers.*
2. *Water Supply and Sanitary Engineering by G.S.Birdie and J.S.Birdie, Dhanpat Rai Publishing Company.*
3. *Water Supply Engineering by P.N.Modi, Standard Book House.*
4. *Water Supply Engineering by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd.*

CE2205   GEOTECHNICAL ENGINEERING – I

Introduction: Soil Formation, Minerals in Clays and Sand, Soil Structure, Physical properties of Soil: Void ratio, Porosity, Degree of Saturation, Water Content, Unit Weights, Specific Gravity,

Weight – Volume Relationships, Relative density, Consistency Limits and Consistency Indices, Activity.

Mechanical Analysis and Soil Classification: Sieve Analysis, Stoke's Law, Hydrometer and Pipette Analysis, Textural Classification, Classification based on Size, Unified Soil Classification and Indian Standard Soil Classification Systems, Field Identification of Soils

Soil Hydraulics: Types of Soil Water, Capillary Rise and Surface Tension, Darcy's Law and its Limitations, Constant Head and Variable Head Permeability Tests, Factors Effecting Coefficient of Permeability, Permeability of Stratified Soils. Total, Neutral and Effective Stresses, Effective Stress Principle, Upward Flow Conditions, Quick Sand Conditions, Critical Hydraulic Gradient.

Stress Distribution in Soils: Boussinesq's Theory for Determination of Vertical Stress, Assumptions and Validity, Extension to Line, Strip, Rectangular and Circular Loaded Areas, Pressure Bulb and Influence Diagrams, Newmark's Influence Chart – Construction and Use, Westergaard's Theory, 2:1 Load Dispersion Method, Contact Pressure Distribution beneath Footings.

Compaction: Mechanism of Compaction, Factors Effecting Compaction, Laboratory Compaction Tests, Effect of Compaction on Soil Properties, Field Compaction: Compaction Equipment and Evaluation of Field Compaction.

Consolidation: Basic Definitions: Compression Index, Coefficient of Compressibility and Coefficient of Volume Decrease; Spring Analogy for Primary Consolidation; Initial Compression, Primary Compression and Secondary Compression, Generation of Effective Stress-Void Ratio Relationship from Consolidation Test: Height of Solids Method and Change in Void Ratio Method; Determination of Preconsolidation Pressure, Normally Consolidated, Over Consolidated and Under Consolidated Clays, Terzaghi's One Dimensional Consolidation Theory – Assumptions, Derivation of Differential Equation and Solution, Laboratory Determination of Coefficient of Consolidation by Time Fitting Methods.

Shear Strength of Soils: Stress at a Point, Mohr Circle of Stress, Mohr-Coulomb Failure Theory, Shear Parameters, Laboratory Shear Tests – Shear Box, Triaxial and Unconfined Compression Tests, Laboratory and Field Vane Shear Tests, Sensitivity of Clays, Types of Shear Tests based on Drainage Conditions, Total Stress Analysis and Effective Stress Analysis, Shear Strength of Sands, Critical Void Ratio and Dilatancy, Liquefaction of Soils, Factors affecting Shear Strength of Clays and Sands,

Text Books

1. *Soil Mechanics and Foundation Engineering by K.R. Arora, Standard Publishers*
2. *Basic and Applied Soil Mechanics by Gopal Rajan and A.S.R. Rao, New Age International Publishers.*
3. *Geotechnical Engineering by P. Purushothama Raj, Pearson Publishers*

OP-I: CE2206   MANAGERIAL ECONOMICS

Unit -I

Significance of Economics and Managerial Economics:

Economics: Definitions of Economics– Wealth, Welfare and Scarcity definition Classification of Economics– Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand Analysis: Demand – Definition, Meaning, Nature and types of demand, Demand function, Law of demand – Assumptions and limitations. Exceptional demand curve. Elasticity of demand – Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Demand Forecasting – Need for Demand forecasting, Factors governing demand forecasting, Methods of demand forecasting: Survey methods– Experts' opinion survey method and consumers Survey methods.

Utility Analysis: Utility– Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, the law of Diminishing Marginal Utility and its Limitations.

Unit -II

Theory of Production and Cost analysis:

Production – Meaning, Production function and its assumptions, use of production function in decision making; Law of Variable Proportions: three stages of the law.

Cost analysis – Nature of cost, Classification of costs – Fixed vs. Variable costs, Marginal cost, Controllable vs. Non – Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. unavoidable costs, Economies and Diseconomies of scale.

Unit -III

Market Structures: Definition of Market, Classification of markets; Salient features or conditions of different markets – Perfect Competition, Monopoly, Duopoly, Oligopoly, Importance of kinked demand curve; Monopolistic Competition.

Unit -IV

Pricing Analysis: Pricing – Significance: Different Pricing methods– Cost plus pricing, Target pricing, Marginal cost pricing, Going-rate pricing, Average cost pricing, Peak load pricing, Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark-up and Mark-down pricing of retailers.

Unit -V

Business cycles, Inflation and Deflation:

Business cycles – Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles

Inflation –Meaning, Types, Demand-pull and Cost push inflation, Effects of Inflation, Anti-inflationary measures

Deflation– Meaning, Effects of Deflation, Control of Deflation, Choice between Inflation and Deflation

Text Books

    1. *Managerial Economic by Sankaran,S., Marghan Publications.*

    2.*Managerial Economics and Financial Analysis by Aryasri, A.R., MC Graw-Hill Education.*

Reference Books

    1. *Managerial Economics by Dwivedi, D.N., Vikhas Publishing House Pvt. Ltd. 6ᵗʰ Edition.*

    2. *Modern Economic Theory by Dewett, K.K., Chand & Company Ltd.*

CE2207 BUILDING PLANNING AND DESIGN

Residential Buildings: Different types of Residential Buildings, Selection of Site for Residential Building. Brief Information of Housing Colonies for Different Income Groups in India–Sizes of Plots – Public Spaces, Evolutionary Housing Concept.

Climatology: Elements of Climate: Sun, Wind, Relative Humidity, Temperature effects, Comfort Conditions for House, various types of Macro Climatic Zones. Design of Houses and Layouts with Reference to Climatic Conditions. Orientation of Buildings. Solar Charts, Ventilation. Principles of Planning Anthropometric Data

Preliminary Drawings: (a) Conventional Signs of Materials various Equipment used in a Residential Building (copying exercise) (b) Plan, Section and Elevation of a Small House (one room and verandah) (copying exercise) (c) Plan, Section and Elevation of Two Bed Room House (copying exercise) (d) (e) (f) Plan, Section and Elevation of Three Bed Room House in Hot and Humid Zone, Hot and Arid Zone, Cold Zone (copying exercises)

(a) Design of Individual Rooms with Particular Attention to Functional and Furniture Requirements. Building Regulations and Bye-laws of Residential Buildings;

(b) AUTOCAD Drawing of Residential Building (only for internal assessment)

Drawing the Plan, Section and Elevation of Houses with given Functional Requirements and Climatic Data. (emphasis may be given to Hot and Humid zones.)

Text Books

1. *Building Planning and Drawing by N. Kumara Swamy and A.Kameswara Rao, Charotar Publishing House.*

2. *Building Planning Drawing and Scheduling by Gurucharansingh and Jagadish Singh, Standard Publishers Distributors*

Reference Books

1. *Civil Engineering Drawing by Sharma and Gurucharan Singh, Standard Publishers.*

2. *Civil Engineering Drawing Series 'B' by R.Trimurty, M/S Premier Publishing House.*

3. *Building Drawing with an Integrated Approach to Built Environment by M.G.Shah, C.M.Kale and S.Y.Patki, McGraw-Hill Publishing Company Limited.*

CE2208 TOTAL STATION AND GEOMATICS LABORATORY

1. Measurement of Horizontal Angles by Repetition & Reiteration, Measurement of Vertical Angles, Heights and Distances
2. Distance between two In-accessible Points using Theodolite
3. Tachometry
4. Setting Out Curve by Deflection Angle Method using two Theodolites
5. Point Positioning using GPS
6. Contour Mapping using Total Station
7. Height of Remote Point using Total Station
8. Position of Hidden Point using Total Station
9. Area and Volume Measurement using Total Station
10. GIS related Surveying Applications

CE2209 FLUID MECHANICS LABORATORY – I

1. Study of Small Orifice by Constant Head Method and Time of Emptying a Tank through a Small Orifice.
2. Study of Cylindrical Mouthpiece by Constant Head Method and Time of Emptying a Tank through a Cylindrical Mouthpiece.
3. Determination of Metacentric Height of Floating Body.
4. Study of Surface Profiles in Free and Forced Vortex Motions.
5. Study of Venturimeter.
6. Study of Orifice meter.
7. Study of Flow Nozzle Meter.
8. Study of Sharp-crested Full Width and Contracted Weirs.
9. Study of V-Notch and Trapezoidal Notch.
10. Study of Broad-crested Weir.

Department of Civil Engineering
SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

III Year – I Semester

CE3101 STRUCTURAL ANALYSIS – II

Analysis of Statically Indeterminate Trusses (having not more than 7 members and 3 supports) containing (a) External Redundant Supports (b) Internal Redundant Members using (i) Method of Consistent Deformation of Unit Load Method (ii) Castigliano's Theorem – II.

Analysis of Three Span Continuous Beams using Kani's Method, Analysis of Statically Indeterminate Frames (Single Storey, Single Bay Portal Frames only) using (i) Slope-deflection method (ii) Moment Distribution Method (iii) Kani's Method.

Arches: Normal Thrust, Radial Shear and Bending Moment in Three Hinged and Two Hinged Parabolic and Segmental Arches. Effects of Rib-shortening and Temperature Change.

Suspension Bridges: Stresses in Loaded Cables with Supports at the Same and Different Levels. Length of Cable; Two and Three Hinged Stiffening Girders.

Introduction to Matrix Methods of Structural Analysis (Very elementary treatment only), Static Indeterminacy, Kinematic Indeterminacy, Stiffness and Flexibility Method for Two Span Continuous Beams only– Truss with 3 supports and 7 members.

Text books

1. Theory of Structures by S.Ramamrutham, R.Narayan, Dhanpat Rai, Publishing Company.

2. Theory of Structures by B.C.Punmia, Ashok K Jain,Arun K Jain, Laxmi Publications.

3. Mechanics of Structures Vol II by S.B.Junnarkar, H.J.Shah, Charotar Publishing House.

Reference Books

1. Statically Indeterminate Structures by C.K. Wang, Mcgraw-Hill.

2. Structural Analysis – A Matrix Approach by G.S. Pandit and S.P. Gupta, McGraw-Hill Education.

3. Indeterminate Structures by R.l. Jindal, S. Chand Publishers.

CE3102 ENVIRONMENTAL ENGINEERING – II

Introduction to Sanitation – Systems of Sanitation – Relative Merits and Demerits – Collection and Conveyance of Wastewater – Sewerage – Classification of Sewerage Systems– Estimation of Sewage Flow and Storm Water Drainage – Fluctuations – Types of Sewers – Hydraulics of Sewers and Storm Drains – Design of Sewers – Materials for Sewers – Appurtenances in Sewerage – Cleaning and Ventilation of Sewers – Safety of Sewer Workers .

Storm Sewers – Design: Pumping of Wastewater – Pumping Stations – Location – Components Parts – Types of Pumps and their Suitability with regard to Wastewaters. House Plumbing: Plumbing Systems of Drainage – Sanitary Fittings and other Accessories – Single Stack System – One Pipe and Two Pipe Systems – Design of Building Drainage.

Bacteriology of Sewage: Sewage Characteristics – Physical, Chemical and Biological Examination – Decomposition – Cycles of Decomposition – Sampling and Analysis of Wastewater – BOD-COD – Treatment of Sewage – Primary Treatment: Screens–grit Chambers – Grease Traps – Floatation – Sedimentation – Design of Primary and Pretreatment Units.

Secondary Treatment: Aerobic and Anaerobic Treatment Process B– Comparison.

Suspended Growth Process: Activated Sludge Process, Principles, Designs and Operational Problems, Modifications of Activated Sludge Processes, Miscellaneous Methods, Oxidation Ponds, Oxidation Ditches, Aerated Lagoons.

Attached Growth Process: Trickling Filters – Mechanism of Impurities Removal – Classification – Filter Problems, Design and Recirculation. RBCs, Fluidized Bed Reactors, Sewage Disposal Methods.

Anaerobic Processes: Septic Tanks and Imhoff tanks – Principles and Design – Sludge Treatment and Disposal-Fundamentals of UASB. Biosolids (Sludge): Characteristics – Thickening – Digestion, Drying and Sludge Disposal.

Text Books

1. Wastewater Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw-Hill edition.
2. Environmental Engineering by Peavy, H.S., Rowe, D.R., and Tchobanoglous, G. McGraw-Hill international edition
3. Environmental Engineering. II: Sewage Disposal and Air Pollution Engineering, Khanna Publishers.

Reference Books

1. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, by S.K.Garg, Khanna Publishers
2. Water Supply and Sanitary Engineering by G.S.Birdie and J.S.Birdie, Dhanpat Rai Publishing Company.
3. Water Supply Engineering by P.N.Modi, Standard Book House.
4. Water Supply Engineering by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd.

CE3103 REINFORCED CONCRETE STRUCTURES – I

(IS-456 code book is allowed for examination)

General: Loading Standards as per IS 875, Grades of Steel and Cement, Stress-Strain Characteristics of Concrete and Steel, Introduction to Working Stress Method and Limit State Method (L.S.D.) of Design.

Limit State of Collapse of in Flexure: Central Value measures, Measures of Distribution, Normal Distribution Curve. Introduction and Principles of L.S.D., Characteristic Load and Strengths, Design Values, Partial Safety Factors, Factored Loads.

Limit State of Collapse: Flexure of R.C.C. Beams of Rectangular section. Under Reinforced, Balanced and Over Reinforced Sections. Compression Stress Block, Estimation of Ultimate Moment by Strain Compatibility. Guide Lines for choosing Width, Depth and Percentage of Reinforcements in Beams. Analysis and Design of Singly Reinforced Rectangular Beams and Doubly Reinforced Beams, Design of Flanged Beams (T and L), Effective Flange Width, Basis of Analysis and Design, Minimum and Maximum Steel in Flanged Beams.

Design of One way and Two way Slabs: Simply Supported Slabs on all Four Sides, Moment in Two way Slabs with Corners held down. Choosing Slab Thickness. Design of Restrained Slabs (with Torsion at corners) I.S. Code Provisions. Detailing of Reinforcement.

Shear, Torsion and Bond: Limit State of Collapse in Shear, Types of Shear Failures. Truss Analogy, Shear Span/Depth Ratio. Calculation of Shear Stress, Types of Shear Reinforcement. General Procedure for Design of Beams for Shear. Enhanced Shear near Supports. Shear in Slabs, Steel detailing. Analysis for Torsional Moment in a Member. Torsional Shear Stress in Rectangular and Flanged Sections.

Reinforcement for Torsion in RC Beams. Principles of Design for Combined Bending Shear and Torsion. Detailing of Torsion Reinforcement – Concept of Bond, Development Length, Anchorage, Bond, Flexural Bond.

Columns: Short and Long Columns, Minimum Eccentricity, Short Column under Axial Compression, Column with Helical and Tie Reinforcement.

Footings: Analysis and Design of Isolated Square and Rectangular Footings.

Text Books

1. Limit State of Design of Reinforced Concrete by P. C. Vergheese, Prentice Hall India Learning.
2. Reinforced Concrete Limit state Design by A.K. Jain, Nem Chand & Brothers.
3. R.C.C Design by Unnikrishna Pillai and Devadas Menon, McGraw-Hill

Reference Books

1. Limit State Design of Reinforced Concrete Structures by P. Dayaratnam, P.Sarah, Oxford and IBH Publishers.
2. Reinforced Concrete Structures by R.Park and T.Paulay, Wiley Publishers.

CE3104 STEEL STRUCTURES – I

Note: All the designs should be taught in the limit state design method as per IS 800-2007

Fundamental Concepts of Limit State Design of Structures, Different types of Rolled Steel Sections available to be used in Steel Structures. Stress – Strain relationship for Mild Steel

Bolted Connections: Behavior of Bolted Joints, Design Strength of Ordinary Black Bolts, High Strength Friction Grip Bolts, Simple Connections, Moment Resistant Connections

Welded Connections: Advantages of Welding, Types and Properties of Welds, Types of Joints, Weld Specifications Design of Welded Joints subjected to Axial Load, Eccentric Welded Connections

Tension Members: Types of Tension Members, Design of Strands, Slenderness Ratio, Displacement of Tension Members, Behavior of Tension Members, Modes of Failure, Factors affecting Strength of Tension Members, Angles under Tension, Design of Tension Members, Lug Angles, Splices

Compression Members: Possible Failure Modes, Classification of Cross-section, Behavior of Compression Members, Effective Length, Radius of Gyration and Slenderness of Compression Members, Allowable Stresses in Compression, Design of Axially Loaded Compression Members, Built up Compression Members, Laced and Battened Columns, Eccentrically Loaded Columns, Column Splices.

Beams: Beam Types, Section Classifications, Lateral Stability of Beams, Allowable Stress in Bending, Shear and Bearing Stresses, Effective Length of Compression Flange, Laterally Supported and Unsupported beams, Design of Built up Beams.

Roof Trusses: Types of Trusses, Economical Spacing of Roof Trusses, Loads on Roof Trusses, Estimation of Wind Load on Roof Trusses as per IS: 875. Design of Members of Roof Truss and Joints, Design of Purlins.

Column Bases and Foundations: Allowable Stress in Bearing, Slab Base, Gusset Base and Grillage Foundations.

Introduction to Pre-engineered Structures, Concepts, Advantages and Disadvantages.

Text Books
1. Limit State Design of steel structures by S.K.Duggal, McGraw-Hill Education Private Ltd.
2. Design of steel structures by K.S.Sai Ram, Pearson Education India.
3. Limit State Design of steel structures by Ramchandra and Virendra Gehlot, Scientific Publishers (India).

Reference Books
1. Design of Steel structures by N. Subramanian, Oxford University Press.
2. Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK International Publishing House.

PE-I: CE3105A   CONCRETE TECHNOLOGY

Chemical and Mineral Admixtures: Water Reducers, Air Entrainers, Set Controllers, Special Admixtures – Structure, Properties and effects on Concrete Properties. Introduction to Supplementary Cementing Materials and Pozzolans – Fly ash, Blast Furnace Slag, Silica Fume, and Metakaolin – their Production, Properties, and Effects on Concrete Properties; Other Mineral Additives – Reactive and Inert.

Dimensional Stability and Durability: Creep and Relaxation – Parameters Affecting; Shrinkage of Concrete – Types and Significance. Parameters affecting Shrinkage; Measurement of Creep and Shrinkage.

Durability of Concrete: Introduction to Durability; Relation between Durability and Permeability – Chemical Attack of Concrete; Corrosion of Steel Rebars; other Durability Issues.

Mix Design: Review of Methods and Philosophies of IS, BS and ACI Methods, Mix Design for Special Purposes. Acceptance Criteria for Compressive Strength of Concrete

Special Concretes: Properties and Applications of High Strength – High Performance Concrete, Reactive Powder Concrete, Lightweight, Heavyweight and Mass Concrete; Fibre Reinforced Concrete; Self-compacting Concrete; Shotcrete.

Text Book
1. Concrete Technology Theory and Practice by M.S.Shetty, S.Chand & Company Ltd, New Delhi.

Reference Books
1. Properties of Concrete by A.M.Neville, Longman 1995.
2. Concrete micro-structure, Properties and Materials by P.K.Mehta, J.M.Monteiro, Printice Hall INC & McGraw-Hill, USA.

PE I: CE3105B   REMOTE SENSING AND GIS APPLICATIONS

Remote Sensing: Introduction, Basic Components of Remote Sensing, Electromagnetic Radiation, Electromagnetic Spectrum, Interaction with Atmosphere, Energy Interaction with the Earth Surfaces,

Sensors – Types and Characteristics, Passive Sensor, Active Sensor, Platforms –Airborne Remote Sensing, Space Borne Remote Sensing, Data Pre-processing, Important Remote Sensing Programmes.

Geographic Information System: Introduction, Key Components, Spatial Data, Raster Data Models, Vector Data Models, Raster Versus Vector, Data Input Methods and Editing, Non-Spatial Data, Map Projections.

Image Analysis: Introduction, Elements of Visual Interpretations, Digital Image Processing – Digital Image Data Formats – Band Interleaved by pixel, Band Interleaved by line, Band Sequential, Image Preprocessing, Image Rectification, Image Enhancement, Image Classification, Supervised Classification, Unsupervised Classification.

GIS Analysis: Introduction, Digital Elevation Models, RS and GIS Data Integration, Overlay Function – Vector Overlay Operations, Raster Overlay Operations, Arithmetic Operators, Comparison and Logical Operators, Conditional Expressions, Overlay using a Decision Table, Some Neighbourhood Operations.

RS and GIS Applications in Civil Engineering: Land Cover and Land Use, Urban Applications, Hydrological Studies, Runoff Modeling, Flood Zone Delineation and Mapping, Groundwater Prospects and Recharge, Reservoir Storage Estimation, Water Management, Irrigation Planning, Drought Monitoring, Environmental Impact Assessment and other Watershed Studies.

Text Books

1. Remote Sensing and Image Interpretation by Thomas M. Lilles and Ralph W. Kiefer, John Wiley and Sons Inc.
2. Introduction to Geographical Information Systems by Kang-tsung Chang, TMH Publications & Co.

Reference Books

1. Fundamentals of Remote Sensing and its Applications by Dr George Joseph, Universities Press.
2. Concepts & Techniques of GIS by C.P. Lo Albert, K.W.Young, Prentice Hall (India) Publications.
3. Principles of Geographical Information Systems by Peter A. Burragh and Rachael A. Mc Donnell, Oxford Publishers.

PE-I: CE3105C   GEO-ENVIRONMENTAL ENGINEERING

Wastes: Source, Production and Classification of Wastes, Soil Pollution Processes, Waste Characterization, Physical Characterization, Problems due to Improper Disposal of Wastes, Waste Management Strategies.

Soil Pollution, Sources of Soil Pollution, Control of Soil Pollution.

Waste Disposal Facilities such as Landfills, Configuration or Types of Landfill, Components of Landfill, Layout of a Landfill Site, Stages of Decomposition of Waste in a Landfill, Landfill Planning and Design. Barrier Systems – Active Systems, Passive Systems, Vertical Barriers and their Types, Bottom Barriers, Reuse of Waste Materials, Contaminated Site Remediation.

Text Book

1. Geoenvironmental Engineering – Principles and Applications by Reddi, L. N., and Inyang, H. F., Marcel Dekker.

Reference Books

1. Geotechnical Practice for Waste Disposal by Daniel, D. E., Chapman and Hall, London.
2. Clay Barrier Systems for Waste Disposal Facilities by Rowe, R. K., Quigley, R. M. and Booker, J.R., E & FN Spon, London.

OP II: CE3106   BUILDING SERVICES AND MAINTENANCE

Ventilation and Air conditioning: Ventilation–Necessity of Ventilation – Functional Requirements–Systems of Ventilation – Types – Natural Ventilation – Artificial Ventilation –Air Conditioning – Systems of Air Conditioning – Essentials of Air Conditioning systems –Protection against fire caused by Air Conditioning Systems.

Thermal Insulation: Heat Transfer – Thermal Insulating Materials – General Methods of Thermal Insulation – Economics of Thermal Insulation – Thermal Insulation of Exposed Walls, Doors, Windows and Roofs.

Fire Safety: Fire Hazards, Causes of Fire in Buildings, Fire Load – Safety Regulations –Characteristics of Fire Resisting Materials – General Fire Safety Requirements for Buildings –NBC – Planning Considerations in Buildings like Non–combustible Materials, Fire Resistant Construction, Staircases and Lift Lobbies, Fire Escapes and A.C. Systems – Building Types –Heat and Smoke Detectors – Fire Alarms, Snorkel Ladder – Fire Fighting Pump and Water Storage –Dry and Wet Rises – Automatic Sprinklers.

Plumbing Services: Water Supply System –Fixing the Pipe in Building – Maintenance of Building Pipe Line – Water Meters – Sanitary Fittings – Principles Governing Design of Building Drainage – Gas Supply Systems.

Machineries in Buildings: Lifts – Definitions – Essential Requirements – Design Considerations – Maintenance Escalators – Essential Requirements, Pumps – Types of Pumps, Pumps for Household, Flats and Pumps for Dewatering

Electrical Installation in Buildings: Lighting for Office Buildings – School Buildings –Residential Buildings – Fannage – Air Conditioning/Heating – Reception and Distribution of Main Supply – Fittings and Accessories – Method of Internal Wiring – Earthing – Planning of Electrical Installations – Lightening Arrestors – Earthing

Anti–termite Treatment: Types of Termites, Internal and External Anti-termite Treatments – Pre-construction Treatment – Post-construction Treatment – Preventive Measures.

Text Books

1. Building Construction by B.C.Punmia, Er. Ashok K Jain, Arun K Jain, Laxmi Publications (P) Ltd., New Delhi.
2. Building Construction by Janardhan Jha, S K Sinha, Khanna Publishers.
3. Building construction by Rangwala, Charotar Publishibg House.

Reference Books

1. National Building Code, Bureau of Indian Standards.
2. Building Services Engineering by David V.Chadderton, Routledge
3. Building Construction by P.C.Varghese, Prentice Hall India Learning.

CE3107 GEOTECHNICAL ENGINEERING LABORATORY – I

1. Determination of Specific Gravity of Coarse Grained and Fine Grained Soils
2. Determination of Atterberg Limits of Clay
3. Determination of Field Density by Core Cutter and Sand Replacement Methods
4. Determination of Grain Size Distribution of Coarse Grained Soil by Sieve Analysis

5. Determination of Grain Size Distribution of Fines Fraction of Soil by Hydrometer/pipette Analysis.

6. Determination of Coefficient Permeability of Coarse Grained Soil by Constant Head Permeability Test

7. Determination of Coefficient Permeability of Fine Grained Soil by Variable (Falling) Head Permeability Test

8. Determination of Compaction Characteristics of Soil by IS Light / Heavy Compaction Test.

Demonstration Experiments:
1. Rapid Moisture Meter Test for Quick Determination of Water Content
2. Determination of Water Content of Compacted Soil in Field by Proctor's Plasticity Needle

Reference Books
1. Relevant IS Codes of Practice

CE3108   ENVIRONMENTAL ENGINEERING LABORATORY

1. Determination of pH and Conductivity of a given water and wastewater sample
2. Measurement of Turbidity using Nephelometric Turbid meter and Determination of optimum coagulant dosage (Jar Test).
3. Determination of Hardness in a given water sample
4. Estimation of Acidity of a water sample
5. Estimation of Alkalinity of a waste and wastewater sample
3. Determination of Available Chlorine in a given Bleaching power sample and residual Chlorine in a water sample
4. Estimation of Fluorides in a given water sample.
5. Estimation Iron in a water sample
6. Estimation of Total Solids: Settleable Solids: Suspended solids, dissolved solids.
7. Measurement of D.O. by volumetric analysis
8. Estimate the B. O. D. of a wastewater sample.
9. Estimate the C. O. D. of a wastewater sample.
10. Estimation of Chlorides in a water sample
11. Estimation of Nitrates in a given sample

Text Books

1. Environmental Engineering Laboratory Manual by Kotaiah, B. and Kumara Swamy, N. Charotar Pub. House.

2. Chemical Analysis of Water and Soil: A laboratory Manual by Muralikrishan K.V.S.G.., Envir. Prot. Society.

Department of Civil Engineering
SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

III Year – II Semester
CE3201   ESTIMATION, SPECIFICATIONS AND CONTRACTS

Introduction: Standard Units, Units of Measurement of Different items of Work. Meaning of Estimate, Tender, Contract, Price Escalation. Errors in Estimation, Different types of Estimates. Contingencies and Related Terms in the Estimate, Different types of Approvals. Plinth Area and Related Terms used in the Estimation of various Structures, Rules and Methods of Measurements of different Works.

Specifications: Meaning, Purpose, types of Specifications, Method of preparation of Specification, General Specification, Detailed Specifications of different items of Buildings and other Structures – Rate Analysis – Data Sheet for Materials and various items of work in Buildings and other Structures, Schedule of Rates, Abstract Estimate of Buildings.

Detailed Estimate of Buildings. Different items of work in Building; Principles of taking out Quantities, Detailed Measurement Form; Long Walls and Short Walls method of Building Estimate, Centre Line Method of Building Estimate. Estimate of RCC Building, Slope Roof Buildings; G.I. and A.C. Sheet, Detailed Estimate of different types of Doors and Windows, Electricity and Water Supply, Sanitation Works etc.

Estimate of Earthwork; Different Formulae for Calculations, Estimate of Metalled Road, Tar Road, Concrete Road, Railway Track, Estimate of Culverts and Bridges etc. Valuation of Buildings; Purpose, Different Method of Building Valuation; Different Terms used in Valuation and their Meaning.

Text Books

1. Estimating and Costing in Civil Engineering by B.N. Dutta, Sangam Books.
2. Textbook of estimating and costing by G.S. Birdie, Dhanpat Rai Publishing Company Private Limited.

Reference Books

1. Estimation, Costing, Specifications and Valuation in Civil Engineering by M.Chakraborti.
2. Textbook on Estimating, Costing and Accounts by D.D. Kohli and R.C. Kohli, S Chand & Company Pvt. Ltd.

CE3202   FLUID MECHANICS – II

Navier-Stokes Equations (No Derivation), Boundary Layer Theory: Theory of Boundary Layer – Characteristics of Laminar Boundary Layer – Boundary Layer growth over a Flat Plate (without pressure gradient) – Boundary Layer Thickness and its Characteristics – Displacement, Momentum and Energy Thicknesses; Stability Parameter; Laminar and Turbulent boundary layers.

Boundary Layer Separation – Mechanism of Separation, Control of B.L. Separation; Boundary Layer on Rough Surfaces – Laminar Sublayer, Shear Friction Velocity; Friction Drag.

Turbulent Flow: Critical Reynolds Number – Characteristics of Turbulent Flow – Mean and Fluctuating Components of Velocity. Analysis of Turbulent Flows – Shear Stress due to Turbulence –Velocity distribution for Hydrodynamically Smooth and Rough Pipes; Variation of Friction Factor in Turbulent Flow; Friction Factor for Commercial Pipes – Moody diagram.

Flow through Pipes: Introduction to Pipe Flow and Laws of Friction – Reynolds Experiment; Steady Turbulent Flow through Pipes; Laws of Friction; Darcy-Weisbach Equation.

Total Energy and Hydraulic Gradient – Energy and Hydraulic Gradient Lines; Minor Losses in Pipes; Pipes in Series and Parallel – Equivalent Length of Pipe.

Flow Between Two Reservoirs; Three Reservoir Problems; Distribution Mains; Working Pressures, Design Pressure And Test Procedures; Choice Of Pipe Material; Siphon; Pipe Network Analysis By Hardy–Cross Method; Hydraulic Power Transmission Through Pipes And Nozzles, Water Hammer (Only Concept).

Drag, Lift & Propulsion: Concepts of Drag and Pressure Distribution over Immersed Bodies – Drag and Lift – Deformation Drag, Friction Drag, Form Drag – Drag coefficient.

Distribution of Fluid Pressure on Immersed Bodies – Pressure Distribution for Flow Past a Circular Disk, Sphere; Effects of Eddy Pattern in Two Dimensional Flow –Distribution of Pressure for Two Dimensional Flow Past a Cylinder – von Kármán Vortex Trail, Eddy Shedding; Drag of Immersed Bodies – Variation of Drag Coefficient with Reynolds Number – Drag on Cylinder – Resistance Diagram for Bodies of Revolution; Drag Coefficient of Practical Bodies.

Lift and Propulsion – Effect of Circulation in Irrotational Flow, Generation of Lift around a Cylinder, Magnus Effect.

Open Channel Flows: Basic Concepts – Introduction, Classification of Open Channels – Classification of Flow; Channel Geometry – Geometric Elements of a Channel Section; Velocity Distribution in a Channel Section; Wide Open Channel; Measurement of Velocity; Velocity Distribution Coefficients; Pressure

Distribution in a Channel Section – Effect of Slope on Pressure Distribution; Basic Equations – Chezy's Equation, Manning's Equation.

Uniform Flow Computation; Conveyance of a Channel Section – Section Factor and Hydraulic Exponent. Flow Characteristics in a Closed Conduit with Open Channel Flow; Determination of Normal Depth and Velocity; Design of Channels for Uniform Flow; Design of Non-erodible Channels; Best Hydraulic Section; Determination of Section Dimensions for Uniform Flow; Most Economical Channel Sections – Rectangular, Trapezoidal, Circular and Triangular Channel Sections; Critical Flow – Computation of Critical Flow, Section Factor for Critical Flow.

Application of Energy Principle in Open channels – Definition of Specific Energy, Specific Energy Diagram, Critical depth, Critical Velocity, Conjugate or Alternate Depths, Sub-critical, Critical and Super-critical Flows, Froude Number, Relationship between Critical depth and Specific Energy for Rectangular, Trapezoidal Sections; Application of Momentum Principle in Open channels – Specific Force; Canal Transitions – Change of Depth in Channels with Change in Cross-section and Hump in the Bed; Control Sections; Venturi Flume and Parshall Flume.

Varied Flow in Open Channels: Analysis & computation of G.V.F: Definition of G.V.F. and Derivation of Governing Equation – Mild, Steep, Critical, Horizontal and Adverse Slopes – Backwater and Drawdown Curves – G.V.F. Profiles for Channels with Changing Slopes; Computation of G.V.F. Profiles – Method of Direct Integration (Procedures only), Direct Step Method – Computation of G.V.F. Profiles in rectangular channels using Direct and Single Step methods (Simple Slope cases only).

Rapidly Varied Flow – Hydraulic Jump, Types of Jumps, Hydraulic Jump in Horizontal Rectangular Channels; Surges.

Text Books
1. Fluid Mechanics and Hydraulic Machinery by P.N.Modi and S.M. Seth, Standard Book House.
2. Flow in Open Channels by K.Subramanya, Tata McGraw-Hill Publishing Co. Ltd.

Reference Books
1. Fluid Mechanics by A.K.Jain, Khanna Publishers.
2. Engineering Fluid Mechanics by K.L.Kumar, S. Chand & Co. Ltd.
3. Flow through Open Channels by K.G.Ranga Raju, Tata McGraw-Hill Publishing Co. Ltd.
4. Open Channel Hydraulics by V.T.Chow, McGraw-Hill Ltd.

CE3203   REINFORCED CONCRETE STRUCTURES – II

Retaining Walls: Types of Retaining Walls, Forces on Retaining Walls, Rankine and Coloumb Earth Pressure Theories (c and ϕ soils). Passive Earth Pressure, Drainage of Retaining Walls. Stability Requirements. Preliminary Proportioning of Cantilever Retaining Walls. Design of Cantilever and Counterfort Retaining Walls.

Water Tanks: Stress in Concrete and Steel in Water Tanks, Modular Ratio, Impermeability Requirements, Tanks resting on Ground and below Ground of Circular and Rectangular shapes; Elevated Circular and Rectangular Tanks resting on Maximum of 8 Columns; Design of Staging of Rectangular tanks.

Bridges: Components of a Bridge in Sub Structure and Super Structure. Classification of Bridges. Highway Loading Standards, Kerbs, Footpaths, Railings, Parapet Loadings, Impact, Wind, Longitudinal Forces.

Design of Solid Slabs, Design of T-beam Bridge Deck Slab, Longitudinal and Cross Beams (Design any one component for exam), Courbon's Theory.

Piles and Pile Caps: Design of Bored Cast-in-situ Piles (Bearing and Friction types), Under Reamed Piles. Pile Caps Design; Bending and Truss Methods.

Prestresed Concrete – Reinforced Concrete versus Prestressed Concrete – Prestressing Systems (Freyssinet, Gifford Udal, Magnel-Blatten) – Prestressing Losses – Steel and Concrete for Prestressing – Homogeneous Beam Concept, Limiting Eccentricities, Pressure Line, Elastic Stress Distribution across the Depth due to D.L., Eccentric Prestress and L.L.

Text Books

1. Reinforced Concrete structures Limit State by B. C. Punmia, Laxmi Publications.

2. Design of Reinforced Concrete Structures by M.L.Gambhir, PHI Publications

3. R.C.C Design by Unnikrishna Pillai and Devadas Menon, McGraw-Hill

Reference Books

1. Limit State of Design of Reinforced Concrete by P. C. Vergheese, Prentice Hall India Learning.

2. Reinforced Concrete Limit state Design by P. Dayaratnam and P.Sarah, Oxford and IBH Publishers.

3. Reinforced Concrete Structures by N.Subramanyan, Oxford University Press.

CE 3204   TRANSPORTATION ENGINEERING

Highway Engineering-1: Highway Development and Planning, Classification of Roads, Highway Alignment, Highway Geometrics – Design of Cross-Sectional Elements, Sight Distance, Horizontal and Vertical Alignment.

Highway Engineering-2: Traffic Engineering – Traffic Characteristics, Traffic Studies (Surveys), Traffic Control Devices – Design of Intersections. Design of Pavements – Design Factors, Design of Flexible Pavements – Group Index Method, CBR Methods, Design of Rigid Pavements – Westergaard Equations, I.R.C. Recommendations for Design of Concrete Roads.

Highway Engineering-3: Construction of Roads – Earthen Roads – W.B.M. Roads – Bitumen Roads – Cement Concrete Roads – Highway Materials and their Properties and Tests. Maintenance of all types of Roads – Highway Drainage.

Railway Engineering-1: Historical Development of Railways in India – Advantages of Railways – Classification of Indian Railways – Permanent Way – Components and their Functions – Rail Joints – Creep of Rails – Rail Fixtures and Fastenings.

 Railway Engineering-2: Track Geometric Design–Track Drainage

Text Books

1. Highway Engineering by S.K. Khanna, C.E.G. Justo and A. Veeraragavan, Nem Chand
2. Railway Engineering by S.C. Saxena and S. Arora, Dhanpat Rai Publications Pvt. Ltd.

Reference Books

1. Principle and Practice of Highway Engineering by R.C.Sharma and S.K.Sharma, Asia Publishing House.
2. Transportation Engineering by L.R. Kadiyali, Khanna Publications.
    3. Principles of Transportation Engineering by Partha Chakraborty, PHI Learning.

Introduction to Hydrological Aspects: Water Resources in India, Hydrology in Water Resources Planning – Hydrologic Planning –Water Budget Equation;

Climate and Weather – Importance of Monsoon Rains, Clouds, Storms and Precipitation – Precipitation – Types, Measurement of Rainfall; Influence and Feedbacks of Hydrological Changes Due to Climate Change; Average Depth of Rainfall over an Area, Mean Annual Rainfall, Analysis of Rainfall Data – Consistency of Rainfall Record, Double Mass Curve, Depth –Intensity, Depth-Area-Duration Curves, Frequency of Point Rainfall – Intensity-Duration-Frequency (IDF) Curves, Probable Maximum Precipitation (PMP) Curves; Infiltration – Factors affecting and its Determination, Infiltrometers; Evaporation and Evapo-Transpiration – Pan Evaporation; Runoff – Factors Affecting Runoff, Methods of Determination of Runoff, Hydrograph Analysis, Base Flow Separation, Unit Hydrographs, Hydrograph of Different Durations, Applications of Unit Hydrograph; S-Hydrograph, Synthetic Unit Hydrograph; Stream Flow Measurement – Gauge Discharge Curves.

Groundwater Flow: Mechanics of Interstitial Flow, Definitions, Subsurface Distribution of Water, Ground Water Movement; Darcy's Law; Permeability – Intrinsic Permeability; Well Hydraulics – Steady Flow in Different Types of Aquifers and Wells; Determination of Hydraulic Properties of Aquifer; Well Losses; Specific Capacity of Well; Well Efficiency – Pumping Tests – Recuperation Test Method for Determination of Well Yield.

Rain Water Harvesting and Recharging of Underground Storage – Methods of Recharging – Infiltration Galleries, Infiltration Wells, Springs.

Methods of Construction of Open Well–Yield of an Open Well – Methods of Construction of Tube Wells, Well Shrouding and Well Development, Spacing of Tube Wells, Design of Tube Well; Pumping Requirements, Centrifugal and Bore Hole Type Pumps; Collector Wells.

Reservoir Planning and Flood Routing: Types of Reservoir – Investigations for Reservoir Planning, Selection of Site for a Reservoir, Zones of Storage in a Reservoir; Purpose of Reservoir, Design Studies, Reservoir Regulation, Reservoir Yield, Mass Curve and Demand Curve, Determination of Reservoir Capacity, Yield From a Reservoir of given Capacity; Operating Schedules – Rule Curve for Reservoir Operation; Economics of Water Resources Projects – Apportionment of Total Cost of a Multi Purpose Project, Benefit – Cost Ratio; Reservoir Losses – Measures To Reduce Evaporation Loss in Reservoirs Sedimentation, Control of Reservoir Sedimentation.

Flood Routing – Hydrologic Reservoir Routing by Puls Method of Routing, Channel Routing by Muskingum Method.

Irrigation: Definition of Irrigation, Types of Irrigation Systems – Direct and Indirect, Lift and Inundation Irrigation Systems, Methods of Irrigation – Surface and Sprinkler Methods, Trickle or Drip Irrigation, Soil Moisture Constants, Depth of Water Held By Soil In Different Zones, Water Extraction – Quality of Irrigation Water, Irrigation Efficiencies – Soil Moisture – Irrigation Relationship – Estimating Depth and Frequency of Irrigation on the Basis of Soil Moisture Regime Concept; Water Requirements of Crops, Duty, Delta and Base Period – Their Relationship, Crops – Seasons, Factors Affecting Duty and Methods of Improving Duty, Consumptive Use of Water –Determination of Evapotranspiration – Blaney-Criddle and Penman Equations and Hargreaves Method; Determination of Canal Capacities for Cropping Patterns, Size of Reservoir, Assessment of Irrigation Water Charges.

Canal Systems: Classification of Irrigation Canals – Canal Alignment, Design of Unlined Canals, Regime Theories – Kennedy's and Lacey's Theories, Critical Tractive Force Method, Design Problems – Balancing Depth – L.S. of a Channel – Design According to I.S: 7112, 1975; Schedule of Area Statistics, Cross Section of an Irrigation Channel – Maintenance of Irrigation Channel. Regulation of Channel System – Canal Outlets, Requirements of a Good Outlet – Types of Outlets; Water Logging – Causes and Control – Land Drainage; Canal Lining – Methods, Design of Lined Canals, Canal Navigation – Requirements, Methods to make Navigability Feasible.

Text Books

1. Irrigation and Water Power Engineering by B.C.Punmia and P.B.B. Lal, Laxmi   Publications Pvt. Ltd.
2. Irrigation and Water Resources & Water Power by P.N.Modi, Standard Book House.

Reference Books

1. Irrigation and Hydraulic Structures by S.K.Garg, Khanna Publishers.
2. Engineering Hydrology by K.Subramanya, Tata McGraw-Hill Education Private Limited.
3. Hand Book of Applied Hydrology by V.T.Chow, McGraw-Hill Book Co.
4. Impacts of Climate Change and Climate Variability on Hydrological Regimes by Jan C. van Dam, Cambridge University Press.
5. Hydrology: Principles, Analysis and Design by H.M.Raghunath, New Age International.
6. Ground Water by H.M.Raghunath, New Age International.

PE-II: CE3206A   STEEL STRUCTURES – II

Note: All the designs should be taught in the limit state design method as per IS 800-2007.

Plate Girders (Bolted and Welded): Components of a Plate Girder, Economical Depth, Proportioning of Web and Flanges, Shear Buckling resistance of Web by Simple Post Critical and Tension Field Methods, Curtailment of Flange Plates, Connection of Flange Angles to Web and Flange Angles to Flange Plates.

Web Stiffeners: Design of Bearing Stiffeners. End Panel Design, Design of Intermediate Stiffeners, Connections.

Bridges: Classification, Loadings, Deck type Plate Girder Bridges.

Bearings: Types of Bearings, Plate Bearing, Rocker Bearing, Roller Bearing, Knuckle Pin Bearing.

Water Tanks: Introduction, Design of Elevated Circular and Rectangular Water Tanks.

Plastic Analysis: Introduction, Upper and Lower Bound Theorems, Uniqueness Theorem, Shape Factor, Load Factor; Beams: Collapse Load for Fixed and Continuous Beams, Design of Beams; Frames: Collapse Load for a Frame of Single Bay Single Storey Frame.

Text Books

1. Limit State Design of steel structures by S.K.Duggal, McGraw-Hill Education Private Ltd.
2. Design of steel structures by K.S.Sai Ram, Pearson Education India.
3. Limit State Design of steel structures by Ramchandra and Virendra Gehlot, Scientific Publishers (India)

Reference Books

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

PE II: CE3206B   GROUND IMPROVEMENT TECHNIQUES

In-situ Densification Methods in Granular Soils: Introduction of Vibration at the Ground Surface, Impact at the Ground Surface, Vibration at Depth, Impact at Depth.

In-situ Densification Methods in Cohesive Soils: Introduction, Preconsolidation Preloading using Sand Drains, Sand Wicks, Geodrains/Band drains, Forced Vacuum Preconsolidation, Stone and Lime Columns, Thermal Methods.

Grouting: Objectives, Suspension, Emulsion and Solution Grouts, Categories of Grouting, Grouting Equipment, Stage Grouting in Soils by Tube-a-Manchettee, Ascending and Descending Stage Grouting, Hydrofracture, Grout Control

Reinforced Earth: Principles, Components of Reinforced Earth – Fill, Reinforcing Material and Facing, Evaluation of Interfacial Friction of Fill and Reinforcing Material, Applications of Reinforced Earth, Design Principles of Reinforced Earth Walls

Geotextiles: Introduction, Types of Geotextiles; Functions and their Application, Tests for Geotextiles

Soil Stabilization: Objectives, Methods of Stabilisation, Mechanical Stabilization: Proportioning of Materials by Rothfutch's Method, Factors affecting Mechanical Stabilization, Cement and Lime Stabilization: Mechanisms, Engineering Benefits, Factors affecting Cement and Lime Stabilization, Construction Techniques, Bituminous Stabilization: Types of Soil – Bitumen, Factors affecting Bituminous Stabilization of Soils, Construction Methods.

Deep Mixing of Soils with Lime/Cement: Lime-soil Columns, Soil-Cement Columns, Construction Methods, Applications.

Stone Columns: Introduction, Construction Methods – Vibroflotation Technique and Rammed Stone Column, Functions and limitations.

Text Book

1. Ground Improvement Techniques, P.Purushothama Raj, Lakshmi Publications (P) Ltd.

Reference Books

1. Engineering Principles of Ground Modification, Monfred R Hausmann,Mc Graw-Hill Publishing Co.

2. Highway Engineering, Khanna S.K. and Justo C.E., Nem chand Publications.

PE II: CE3206C   IRRIGATION ENGINEERING

Development of Irrigation: Water Resources of India – Importance of Irrigation in Agriculture – Historical Evolution of Irrigation In India – Irrigation Development During Pre-Colonization – Colonization and Post-Colonization – National Water Policy – Inadequacy of Irrigation Management – Criteria for Good Irrigation Management.

Soil Water Plant Relationship: Soil Physical Properties Influencing Soil – Water Relationship–Forms and Occurrence of Soil Water – Classification of Soil Water – Soil Water Constants – Energy Concept of Soil Water – Forces acting on Soil Water – Soil Water Potential Concept – Soil Water Retention – Soil Moisture Measurement.

Crop Water Requirement: Water Requirement of Crops– Evapotranspiration and Consumptive Use – Methods of Estimating Evapotranspiration – Effective Rainfall – Irrigation Requirement–Duty of Water – Irrigation Efficiencies – Irrigation Scheduling – Irrigation Measurement.

Surface Irrigation Methods: Canal Network and Canal Design – Surface Irrigation Methods – Types – Border Irrigation, Furrow Irrigation and Strip Irrigation– Specifications, Hydraulics and Design. Drip and Sprinkler Irrigation Method: Sprinkler and Drip – History and Development, Types, Components, Design and Layout, Performance Evaluation, Operation and Maintenance.

Drainage Principles and Criteria: Factors to be considered in Land Drainage – Combined Irrigation and Drainage Systems – Water Balance – Equations for Water Balance – Drainage Surveys – Agricultural Drainage Criteria – Effect of Field Drainage Systems on Agriculture.

Irrigation Water Quality: Water Quality for Irrigation – Salinity and Permeability Problem – Root Zone Salinity – Irrigation Practices for Poor Quality Water – Saline Water Irrigation – Future Strategies

Text Books

1. Irrigation Engineering by G.L.Asawa, New Age International Publishers.

2. Irrigation and Water Power Engineering by B.C.Punmia and Pande B.B. Lal, Laxmi Publishing.

3. Irrigation Theory and Practices by A.M.Michael, A.M, Vikas Publishing Pvt Ltd,

4. Irrigation Engineering by Gupta, B.L, and Amir Gupta, Satya Praheshan.

Reference Books

1. Irrigation Water Management (Principles & Practices) by Dilip Kumar Majumdar, Prentice Hall of India (P), Ltd

2. Irrigation Engineering by N,N,Basak, Tata McGraw-Hill Publishing Co. Ltd.

3. Irrigation Engineering by R.K.Sharma, S. Chand & Company Pvt. Ltd.

CE3207 HIGHWAY MATERIAL LABORATORY

Testing of Aggregates: Specific gravity – Sieve Analysis – Shape test – Flakiness Index – Elongation Index – Angularity Number – Aggregate Crushing value – Impact Value – Abrasion value – Stripping Value and Soundness.

Testing of Bituminous Material: Specific Gravity – Penetration Value – Viscosity Value – Softening Point – Ductility Value – Flash and Fire Point.

Testing on Soils: C.B.R. Test (IS 2720 – Part-XVI) – N.D.C. Penetration Test (IS 2720 Part-XXXII) – Group Index.

Testing on Bituminous Mixes: Bitumen Extraction Test, Marshal Stability Test (Demonstration)

Reference Book

1. Highway material testing by S.K. Khanna, C.E.G. Justo and A. Veeraragavan, Nem Chand & Brothers

CE3208 CONCRETE LABORATORY

1) Determination of Specific Gravity and Unit Weight of Cement

2) Determination of Specific Gravity and Unit Weight of Coarse and Fine Aggregates

3) Determination of Normal Consistency of Cement

4) Determination of Initial and Final Setting Time

5) Determination of Fineness of Cement.

6) Determination of Compressive Strength of Cement (for different grades of cement).

7) Determination of Bulking Characteristics of Sand.

8) Sieve Analysis of Coarse and Fine Aggregates and Classification as per IS 383.

9) Workability Tests on Green Concrete by using: Slump Cone, Compaction Factor Apparatus, Flow Table, Vee-Bee Consistometer.

10) Tests on Hardened Concrete.

    a. Determination of Compressive Strength

    b. Determination of Split tensile strength

c. Determination of Modulus of rupture

11) Design of Concrete Mix by using IS Code Method (for class work only)

CE3209   COMPUTER APPLICATIONS IN CIVIL ENGINEERING LABORATORY

Determination of Shear Force, Bending Moment, Deflection for Different Loading Conditions for a Simply Supported Beam and Cantilever Beam. Determination of Fixed End Moments for Different Loading Conditions of a Fixed Beam. Analysis and Design of Singly and Doubly Reinforced Beams. Analysis and Design of Columns, Footings. Estimation of Runoff for a Catchment. Estimation of Friction Factor for Laminar and Turbulent Flows, Minor Losses in Pipe Flow. Conversion of Angles from WCB to RB.

Classification of Soils Determination of Coefficient of Permeability, Degree of Consolidation and Shear Strength. Computation of Water Surface Profiles in Open Channel Flows. Estimation of Settlement of Foundations in Cohesive soil, Stability Analysis of Slopes. Estimation of Earth Pressure in Cohesive and Cohesionless Soils.

Basic AUTO CAD Commands Application of Drafting Tools and Modifying Tools Creation of 3 Dimensional Solids. Application of STAAD Pro/ETABS for the Analysis and Design of various Structural Components of Civil Engineering and Building Frames.

.

Text Books

1. Computer aided design-Software and Analytical tools by C.S. Krishnamoorthy and S. Rajesh, Alpha Science
2. Computer Aided Design in Reinforced Concrete, V.L.Shah, Standard publishers distributors

Department of Civil Engineering
SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

IV Year – I Semester

CE4101 GEOTECHNICAL ENGINEERING – II

Subsoil Exploration: Objectives, Methods of Subsoil Exploration Direct, Semi direct and Indirect Methods, Soundings by Standard, Dynamic Cone and Static Cone Penetration Tests, Types of Boring, Types of Samples, Criteria for Undisturbed Samples, Transport and Preservation of Samples, Borelogs, Planning of Exploration Programmes, Report Writing.

Bearing Capacity: Safe Bearing Capacity and Allowable Bearing Pressure, General and Local Shear Failures, Terzaghi's Bearing Capacity Equations its modifications for Square, Rectangular and Circular Foundations, Factors affecting Bearing Capacity of Soil, Effect of Water Table on Bearing Capacity, IS Code Method for Bearing Capacity of Footings, Allowable Bearing Pressure based on N-values. Bearing Capacity from Plate Load Tests.

Shallow Foundations: Factors effecting locations of Foundation and Design considerations of Shallow Foundations, Types of Shallow Foundations and Choice of Type of Foundations, Foundations on Expansive Soils.

Settlement Analysis: Types of Settlement, Causes of Settlement, Computation of Settlement of Footings in Saturated Clay and Granular Soils, Allowable Settlement. Measures to Reduce Settlement.

Pile Foundations: Classification, Load carrying capacity of Pile – Dynamic Formula, Static Formula, Pile Load Tests; Efficiency of Pile Group, Load Carrying Capacity and Settlement of Pile Groups in Cohesive and Cohesionless soils, Negative Skin Friction, Under Reamed Pile.

Caissons: Types of Caissons, Pneumatic Caissons, Different Shapes of Well Foundations, Relative Advantages and Disadvantages, Different Components of Well and their Functions, Bearing Capacity of Well Foundation, Grip Length, Problems in Well Sinking and Remedial Measures.

Stability Analysis of Slopes: Infinite and Finite Slopes, Stability Analysis of Infinite Slopes, Different Factors of Safety, Types of Slope Failures – Toe, Slope and Base Failure, Stability Analysis of Finite slopes – Swedish Circle Method, Friction Circle Method, Fellineous Method for Location of Critical Slip Circle, Taylor's Stability Number.

Earth Pressure: Types of Earth Pressure, Rankine's Active and Passive Earth Pressure on Smooth Vertical Wall with Horizontal and Inclined Backfills. Coloumb's Wedge Theory, Culmann's and Rebhann's Graphical Methods for Active Earth Pressure of Cohesionless Backfills, Stability Analysis of Retaining Walls.

Bulkheads: Classification, Analysis of Cantilever Sheet Piles in Sand and Saturated Clay, Analysis of Anchored Bulkhead by Free Earth Support Method in Granular Soil.

Text Books

1. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R. Rao, New Age International Publishers
2. Soil Mechanics and Foundation Engineering by K.R. Arora, Standard Publishers.

Reference Books

1. Foundation Engineering by P.C. Varghese, Prentice Hall of India
2. Foundation Analysis and Design by J. E. Bowles, Mc Graw-Hill Publishing Co.

    .

CE4102   FLUID MECHANICS – III

Dimensional Analysis and Similitude: Fundamental Concepts of Dimensional Analysis – Importance of Dimensional Analysis & Model Study; Units and Dimensional Formulae for Various Engineering Quantities; Fourier Concept of Dimensional Homogeneity.

Methods of Arriving at Dimensionless Groups – Non-dimensional Parameters; Rayleigh's Method; Buckingham π method – Buckingham modified method; Omitted and Superfluous variables.

Examples in Dimensional Analysis – Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller,

Similarity and Similarity Laws – Concepts of Similarity – Geometric, Kinematic and Dynamic Similarities; Modeling Criteria; Similarity Laws – Important Dimensionless Numbers – Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.

Application of Similarity Laws to Practical Problems – Bodies Completely Submerged in Fluids, Bodies Subjected to Gravity and Viscous Forces, River Models – Manning's Law; Distorted Models – Depth Distortion and Slope Distortion; Problems Related to Modeling of Spillways, Ships, Pumps and Turbines.

Impact of Jets: Force Exerted by Fluid Jet on Stationary and Moving Flat and Curved Vanes, Torque and Work Done by Series of Moving Vanes.

Hydraulic Machines– Turbines: Introduction and Classification of Turbines – Function of Prime Movers and Pumps, Hydraulic Turbines, Classification Based on Head, Discharge, Hydraulic Action – Impulse and Reaction Turbines, Differences Between Impulse and Reaction Turbines; Choice of Type of Turbine – Specific Speed.

Working of Impulse Turbines and Design Principles – Components and Working Principles of A Pelton Turbine – Work Done; Hydraulic and overall Efficiencies; Design of Pelton Turbine – Working Proportions; Governing Mechanism for a Pelton Turbine.

Working of Reaction Turbines and Design Principles – Components and Working Principles of a Francis Turbine – Work Done; Hydraulic and overall Efficiencies; Design of Francis Turbine – Working Proportions; Governing Mechanism for a Francis Turbine. Draft Tube Theory – Functions and Types of Draft Tubes in Reaction Turbines, Efficiency of Draft Tube; Kaplan Turbine and Working Proportions of Kaplan Turbine.

Performance and Characteristics of Turbines: Unit Quantities, Specific Speed and its Importance; Model Relationships; Operating Characteristic Curves; Cavitation Problem in Turbines – Thoma's Cavitation Factor.

Hydraulic Machines – Centrifugal Pumps Functions of a Pump – Types of Pumps – Selection Criterion – Rotodynamic and Positive Displacement Pumps – Comparison between Centrifugal & Reciprocating Pumps.

Centrifugal Pumps – Components & Working principles of Centrifugal Pumps; Classification of Centrifugal Pumps – Impellers based on Shape and Type of Casing, Pump with Volute Casing, Pump with Vortex Chamber & Pump with Guide vanes, Closed, Semi-closed & Open Impellers, Axial, Radial & Mixed Flow Impellers; Working Head and Number of Stages, Single & Double Suction. Work done by Centrifugal Pumps – Pressure Change in a Pump, Manometric and Static Head – Velocity triangles – Effect of Vane Shape; Pump Losses and Efficiency – Pressure Rise in the Impeller – Minimum Starting Speed of pump – Multistage Pumps; Pumps in Parallel and Series; Cavitation – Limitation of Suction Lift, NPSH and its importance in Selection of Pumps. Performance Characteristics of Pumps – Similarity Relations and Specific speed of Pumps – Dimensionless characteristics – Constant Efficiency Curves of Centrifugal Pumps.

Hydraulic Machines – Reciprocating Pump & Hydraulic Ram: Reciprocating Pumps – Fundamental concepts, Component Parts and Working principle of Single Acting and Double Acting Reciprocating

Pumps – Discharge Coefficient, Volumetric Efficiency and Slip; Work done by Reciprocating pumps – Work Done and Power Input – Indicator Diagram – Effect of Acceleration and Friction on Indicator Diagram – Maximum Speed of Rotation of Crank; Air Vessels and their principles – Modified Indicator Diagram in the presence of Air Vessels, Work Saved due to Presence of Air Vessel, Flow into and from Air Vessel.

Hydraulic Ram – Working Principle of Hydraulic Ram.

Text Books

1. Fluid Mechanics and Hydraulic Machinery by P.N.Modi and S.M. Seth, Standard Book House.
2. Fluid Mechanics by Jain, A.K., Khanna Publishers.

Reference Books

1. Engineering Fluid Mechanics by K.L.Kumar, S. Chand & Co. Ltd.
2. Hydraulic Machines by Jagadish Lal, Metropoliton Book Company.

CE4103 WATER RESOURCES ENGINEERING – II

Storage Works: Classification of Dams, Factors Governing Selection of Types of Dam, Selection of Site, Preliminary Investigation.

Gravity Dams: Forces acting on a Gravity Dam, Stability Criteria, Modes of Failure – Elementary and Practical Profiles, Stability Analysis, Principal and Shear Stress – Construction Joints, Openings in Dams – Galleries, Foundation Treatment of Gravity Dam.

Earth Dams: Types, Foundation for Earth Dams, Design of Earth Dams, Causes for Failure of Earth Dams, Criteria for Safe Design, Phreatic Line, Seepage Analysis – Seepage Control Through Body and Foundation.

Spillways: Essential Requirements, Spillway Capacity, Components, Types of Spillways and Their Working, Design of Ogee Spillway, Energy Dissipation Below Spill Way, Scour Protection, Use of Hydraulic Jump as Energy Dissipater – Design of Stilling Basins – USBR and IS Standard Basins; Spillway Crest Gates – Different Types.

Diversion Head Works: Types, Location and Components, Effects of Construction of Weirs on Permeable Foundation, Bligh's, Lanes and Khosla's Theories, Method of Independent Variables, Design Principles of

Weirs and Barrages, Design of Weirs on Permeable Foundations, Design of Vertical Drop Weir, Silt Control Devices.

Regulation Works: Canal Falls – Definition, Necessity and Location, Classification of Falls, Design Principles of Syphon Well Drop, Notch Fall, Sarada Fall, Straight Glacis Fall; Offtake Alignment; Cross Regulator and Distributary Head Regulator – Design of Cross Regulator and Distributor Head Regulator.

Cross Drainage Works: Types, Factors Affecting the Suitability of Each Types, Classification of Aqueducts, Design Principles of Different Types of Aqueducts.

River Training Works: River Training and its Objectives, Classification of River Training Works, Marginal Embankment, Guide Banks, Groynes, Cutoffs, Bank Pitching, Launching Aprons, Miscellaneous Types of River Training Works.

Water Power Engineering: Development of Hydro Power in India, Assessment of Available Power, Utilisation Factor, Load Factor, Diversity Factor, Storage and Pondage; Types of Hydro Power Schemes; Components of Hydel Schemes – Fore Bay, Intake Structure, Trash Racks, Surge Tanks; Water Hammer Pressure, Substructure and Superstructure of Power House.

Text Books

1. Irrigation and Water Power Engineering by Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2. Irrigation Water Resources and Water Power Engineering by Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic Structures by Garg, S.K., Khanna Publishers.

Reference Book

1. Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.

CE4104 CONSTRUCTION MANAGEMENT

Bar Charts, Milestone Charts, Weaknesses in Bar Charts

PERT and CPM: Introduction, Event, Activity, Dummy Activities, Rules for Drawing Networks, Numbering the Events (Fulkerson's Law)

Time Estimates and Evaluation of Critical Path – Optimistic Time, Most Likely Time, Pessimistic Time, Expected Time, Earliest Allowable Occurrence Time, Latest Allowable Occurrence Time, Slack, Project

Duration, Probability of Completion, Start and Finish Time Estimates, Floats, Project Scheduling, Critical and Sub-Critical Paths.

Cost-Time Optimization: Direct and Indirect Costs, Normal and Crash Costs and Times, Crashing of The Activity, Optimization of Project Cost.

Updating and Resource Allocation – Process of Updating, Updating Cycle, Updated Networks, Resource Histograms, Resource Smoothening, Resource Leveling.

Works Management and Contracts – Department Execution of Works, Master Roll Form 21, Piece Work Agreement Form, Work Order, Definition of Contract, Element of Contract, Valid Contract, Notice Inviting Tender, Tender Forms, Bidding Process, Earnest Money, Security Deposit, Award of Contract, Types of Contracts – Lumpsum Contract, Item Rate Contract, Cost Plus Percentage Contract, Special Contracts, Disputes, Claim Settlement Through Arbitration.

Management – Significance of Construction Management, Concept of Scientific Management, Qualities of Manager, Organization – Authority, Policy, Recruitment Process and Training Development of Personnel.

Labour Problems, Labour Legislation in India, Workmen Compensation Act 1923, and Subsequent Amendments, Minimum Wages Act 1948.

Text books
1. PERT and CPM Principles and Applications by L. S. Srinath, Affiliated East-West press Pvt. Ltd.
2. Estimating and Costing in Civil Engineering (Theory & Practice) by B.N.Dutta UBS Publishers Distributors Pvt. Ltd; 28th Revised Edition.

Reference Books
1. Project Planning and Control with PERT and CPM by B.C. Punmia, Laxmi Publications.
2. Construction Management and Planning by H.Guha and Sen Gupta, Tata McGraw – Hill Publishing Co. Ltd.

PE-III: CE4105A PRESTRESSED CONCRETE STRUCTURES

Introduction, Basic Concepts of Prestressing, Need for High Strength Steel and Concrete, Advantages of Prestressed Concrete; Materials for Prestressed Concrete, High Strength Concrete and High Strength

Steel. Prestressing Systems (1) Freyssinet System (2) Gifford Udall (3) Magnel-Blatan System, Tensioning Devices, Anchoring Devices. (D) Pretensioning and Post Tensioning

Prestressing Losses, Elastic Shortening, Loss due to Shrinkage, Loss due to Creep, Loss due to Friction, Loss due to Curvature etc.; I.S. Code Provisions

Analysis of Prestressed Members, Assumptions, Pressure or Thrust Line; Concept of Load Balancing, Cable Profile, Kern Distance, Stress in Tendons as Per IS 1343, Cracking Moment.

Deflection of Prestressed Concrete Beams

Limit State Design of Flexural Members, Stresses, I.S. Code Provisions, Design of Symmetrical Beams, Design of Prestressed Concrete Poles, Design for Shear, I.S. Code Provisions.

Transfer of Prestress (Pretensioned Members), Transmission Length, Bond Stress, Transverse Tensile Stress, End Zone Reinforcement, Flexural Bond Stress, I.S. Code Provisions.

Anchorage Zone in Post Tensioned Members, Stress Distribution in End Block, Guyon's Method of Approach of Analysis of End Block (not more than 2 Cables).

Text Book

1. Prestressed Concrete by N.Krishna Raju., Tata McGraw-Hill Education

Reference Books

1. Prestressed Concrete by N.Rajagopalan, Alpha Science International.
2. Prestressed Concrete by P. Dayaratnam, Oxford and IBH Publishers.
3. Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns, Wiley India.

PE III: CE4105B ELEMENTS OF COASTAL ENGINEERING

Introduction, General Design Considerations for Coastal Engineering. Long Period Waves: Tides, Seiches, Tsunamis, Storm Surge and Wind Set Up.

Solutions of Linear Wave Equation for Progressive and Standing Waves – Pressure Velocity Fields – Surface Profile and Dispersion Relationship – Principle of Super Position – Wave Energy, Energy Flux and Energy Principle – Group Velocity.

Wave Mechanics. Celerity and Group Velocity. Wind Generated Waves. Wave Statistics. Wave Transformation: Shoaling, Refraction, Diffraction and Reflection. Wave Breaking Criteria. Wave Forecasting for Deepwater Waves.

Beach Profiles and Surf Zone Wave Breaking. Sediment Transport.

Impacts of Coastal Structures on Shoreline Changes. Seawalls, Breakwaters, Groins, Jetties, Wharves.

Wave Forces on Walls. Design of Breakwaters: Rubble Mound-Type, Wall-Type, Structural Cross-Section.

Wave Forces on Piles – Basic Assumptions – Values of the Inertia and Drag Coefficients and Their Dependence on the Wave Theory used.

Text Books

1. Water Wave Mechanics for Engineers and Scientists by R.G.Dean and R.A.Darlymple, World Scientific Publishers.
2. Coastal Hydrodynamics by J.S.Mani. PHI Publishers 2nd Edition.

Reference Books

1. Basic Coastal Engineering by R.M.Sorense, 3rd Edition, Springer.
2. Coastal Engineering Manual (CEM). US Army Coastal Engineering Research Center, 2002-2006. (Download from CECIL or USACE website).

PE III: CE4105C INTRODUCTION TO ROCK MECHANICS

Introduction: Geological Formation of Rocks, Structural Geology, Classification of Rocks, Defects in Rock, Physical, Mechanical Properties of Rocks, Exploration Techniques – RQD and RMR, Laboratory Tests for Shear Strength, Tensile Strength, Flexural Strength, Elastic Constants, Field Tests – Test for Deformability, Shear Tests and Strength Tests

Improvement Techniques for Rock: Grouting, Rock Bolting, Rock Reinforcement - Mechanism, Types of Reinforcement, Steps Involved in Installation,

Foundations on Rock, Rock Blasting– Explosives, Selection Criteria for Explosives, Steps Involved in Blasting

Text book

1. Rock Mechanics for Engineers by B.P.Verma, Khanna Publishers

Reference Books

1. Rock Characterization, Testing and Monitoring by E.T.Brown, Pergamon Press, London, U.K

2. Rock Mechanics on the Design of Structures in Rock by Oberti and Duvalk, W. L. John Wiley & Sons.

3. Rock Mass Classification Systems – A Practical Approach in Civil Engineering by B.Singh and R.K.Goel, Elsevier Publisher.

PE III: CE4105D   SOLID WASTE MANAGEMENT

Introduction: Definition of Solid Waste, Garbage, Rubbish–Sources and Types of Solid Wastes. Characteristics of Solid Wastes: Physical, Chemical and Biological Characteristics– Problems due to Improper Disposal of Solid Waste.

Solid Waste Management: Definition– Reduction, Reuse, Recycling and Recovery Principles of Waste Management – Functional Elements of Solid Waste Management – Waste Generation and Handling at Source – Collection of Solid Wastes – Collection Methods and Services– Guidelines for Collection Route Layout.

Transfer and Transport of Wastes: Transfer Station – Processing and Segregation of the Solid Waste – Various Methods of Material Segregation.

Processing and Transformation of Solid Wastes: Composting: Definition–Methods of Composting – Advantages of Composting – Incineration: Definition – Methods of Incineration–Advantages and Disadvantages of Incineration.

Disposal of Solid Waste: Volume Reduction, Open Dumping, Land Filling Techniques. Landfills: Classification–Design and Operation of Landfills, Land Farming, Deep Well Injection.

Text Books

1. Integrated Solid Waste Management: Engineering Principles and Management Issues by George Tchobanoglous, Hilary Theisen, Samuel A Vigil. McGraw-Hill Series in Water Resources and Environmental Engineering.

2. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Techobanoglous.

PE-IV: CE4106A   ENVIRONMENTAL IMPACT ASSESMENT

Concept of Environment – Definition of EIA and EIS – Elements of EIA – Guidelines for the Preparation of EIS – Governmental Policies for Environmental Protection.

Environmental Setting – Environmental Attributes – Air, Water, Soil, Noise, Ecological, Social, Economical, Cultural, Human and Aesthetic Aspects – Environmental Indices.

Methodology for the Identification of Impacts – Criteria for the Selection of Methods – Methodologies – Adhoc, Checklist, Overlaying, Matrix and Network Methods.

Prediction and Assessment of Impacts on – Air, Water, Soil, Noise, Ecological, Social, Economical, Cultural, Human Environments and Aesthetic Aspects.

Review of Environmental Impact Statement – Cost Benefit Analysis – Measures for Environmental Impact Mitigation and Control – Case Studies.

Text Books
1. Environmental Impact Assessment by Larry W. Canter. McGraw-Hill Co.
2. Environmental Impact Assessment Methodologies by Y Anjaneyulu, and Valli Manikkam,, BSP Books PVT Ltd.

Reference Book
1. Environmental Impact Assessment by R.K.Jain, L.V.Urban, G.S.Stacey and H.E. Balbach, McGraw-Hill Co.

PE-IV: CE4106B   EARTH RETAINING STRUCTURES

Earth Pressure: Basic Concepts, Rankine and Coulomb Earth Pressure Theories, Determination of Active and Passive Pressures: Culmann's Graphical Method, Logarithmic Spiral Methods, Friction Circle Method. Consideration of Surcharge, Seepage, Earthquake, Wave Effect, Stratification, Type of Backfill, Wall Friction and Adhesion.

Retaining Structures: Uses, Types, Stability and Design Principles of Retaining Walls, Backfill Drainage, Settlement and Tilting. Sheet Pile Walls: Types, Design of Cantilever Sheet Pile Walls in Granular and Cohesive Soils; Design of Anchored Sheet Pile Walls by Free and Fixed Earth Support Methods, Rowe's Theory of Moment Reduction, Design of Anchors. Braced Excavations: Types of Sheeting and Bracing Systems, Lateral Earth Pressure on Sheeting in Sand and Clay, Design Components of Braced Cuts. Cellular Cofferdams: Types – Diaphragm and Circular Type, Design by TVA Method. Stability of Cellular Cofferdams, Cellular Cofferdams in Rocks and Soils.

Text Book

1. Foundation design by W. C. Teng, Prentice Hall

Reference Books

1. Basic and Applied Soil Mechanics by Gopal Rajan and A.S.R. Rao, New Age International Publishers.
2. Soil Mechanics in Engineering Practice by K.Terzaghi and R.B.Peck, John Wiley & Sons.
3. Foundation Analysis and Design by J. E. Bowles, Mc Graw-Hill Publishing Co.

PE-IV: CE4106C   AIRPORT PLANNING AND DESIGN

Air Transport: History of Air Transport, Structure and Organisation of Air Transport, National Airports Authority, Airports Authority of India, International Civil Aviation Organisation. Airport Characteristics: Requirements of Aircraft Types, Weight Components, Aeroplane Component Parts, Classification of Flying Activity, Aircraft Characteristics.

Airport Planning: Airport Master Plan, Regional Planning, Airport Site Selection, Estimation of Future Air-Traffic Needs. Airport Obstructions: Zoning Laws, Classification Of Obstructions.

Runway Design: Runway Orientation, Basic Runway Length, Corrections, Airport Classification, Runway Geometry Design. Airport Capacity and Configuration, Runway Intersection Design,

Taxiway Design: Geometric Design Standards, Exit Taxiways, Holding Aprons.

Terminal Area and Airport Layout: Building Area, Terminal Area, Apron, Hangar, Typical Airport Layouts.

Visual Aids: Airport Marking, Airport Lighting

Air Traffic Control: Need of Air Traffic Control Air Traffic Control Network, Air Traffic Control Aids – Enroute Aids and Landing Aids, Instrumental Landing System

Text Book

1. Airport Planning and Design by S.K. Khanna, M.G. Arora, S.S. Jain, Nem-Chand and Bro.

Reference Book

1. Airport Engineering by Rangwala, Charotar Publications.

Matrix Methods of Analysis – Introduction, Analysis of Beams and Portal Frames (One Bay, One Storey Two Bay, Two Storey) by Stiffness Method and Flexibility Method.

Introduction: A Brief History of F.E.M, Need of the Method, Applications of FEM, Review of Basic Principles of Solid Mechanics, Basic Equation in Elasticity Equations of Equilibrium, Constitutive Relationship, Concept of Plane Stress, Plain Strain, Concept of Axi-Symmetric Elements. Concept of Energy Principles and Methods.

Basic Theory Relating to the Formulation of the Finite Element Method, Element Shapes, Nodes, Nodal Degree of Freedom, Node Numbering, Coordinate System (Local and Global), Convergence Requirements, Compatibility Requirement, Geometric Invariance.

Finite Element Analysis of Single Bar Element (One-Dimensional Problem) – Shape Functions, Derivation of Stiffness Matrix, Stress-Strain Relations – All with Reference to Bar Element and Trusses under Axial Forces.

Text Books

1. Structural Analysis – A Matrix Approach by G.S.Pandit and S.P.Gupta, Tata McGraw-Hill Publishing Co. Ltd.

2. Introduction to the Finite Element Method by C.S.Desai and J.F.Abel, Van Nostrand.

3. Finite Element Analysis by C.S.Krishnamoorthy, Tata McGraw-Hill Publishing Co. Ltd.

Reference Books

1. Introduction to Finite Elements in Engineering by Tirupathi R. Chandrupatla, Ashok D.Belegundu, Prentice-Hall of India Private Limited.

2. Finite Element Analysis by S.S.Bhavikatti, New Age International Publishers.

3. Basic Structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi.

4. Finite Element Methods for Engineers by Reger, T. Fenuer, The Macmillan Ltd., London.

CE4107 GEOTECHNICAL ENGINEERING LABORATORY – II

1. Field identification and Classification of Soils
2. Determination of Relative Density of Sand
3. Determination of Unconfined Compressive Strength of Clay
4. Determination of Shear Parameters of Soil by Direct Shear Test
5. Determination of Undrained Shear Parameters of Soil by Triaxial Compression Test
6. Determination of Undrained Shear Strength and Cohesion of Soft Clay by Vane Shear Test
7. Determination of Differential Free Swell and Swell Pressure of Clay
8. Determination of Coefficient of Consolidation of Clay by Taylor and Casagrande Methods of Time Fitting

Demonstration experiments
1. Standard Penetration Test
2. Determination of Compression Index of Clay by Oedometer Test

Reference Books
1. Relevant IS Codes of Practice

CE4108 FLUID MECHANICS LABORATORY– II

1) Study of Characteristics of a hydraulic jump – To measure and draw (E1-E2)/E1 vs F1 and Lj / y2 vs F1, and compare with theoretical results wherever possible.
2) Study of Rugosity Coefficients in an Open Channel Flow.
3) Study of Major Losses in Pipes – Pipe Friction – To Compute Darcy-Weisbach Friction Factor.
4) Study of Drag Characteristics of a Circular Cylinder with its Axis Normal to the Direction of Flow.

    To measure the Pressure Distribution on the Surface of a Cylinder and Plot the Dimensionless   Pressure Variation around the Cylinder and Compute the Pressure Drag.

    To measure the Velocity Variation in the Wake of the Cylinder, Velocity of Approach, and Compute the Total Drag by Momentum Principle.

5) Study of Performance Characteristics of a Centrifugal Pump – To Measure the Discharge, Head Developed and Power Input at Various Discharges for Centrifugal Pump and Draw the Performance Characteristics.

6) Study of Performance Characteristics of a Reciprocating Pump – To Measure the Discharge, Head Developed and Power Input at Various Discharges for Reciprocating Pump and Calculate Percentage Slip and Efficiency.

7) Study of Performance Characteristics of a Pelton Turbine – To Measure the Discharge, Head Difference across the Turbine, the Brake load, Speed of Turbine for Various Discharges and Draw the Performance Characteristics.

8) Study of Performance Characteristics of a Francis Turbine – To Measure the Discharge, Head difference across the Turbine, the Brake Load, Speed of Turbine for Various Discharges and Draw the Performance Characteristics.

9) Study of Impact of a Jet on Flat and Curved Vanes.

Department of Civil Engineering
SYLLABUS FOR
B.Tech. (CIVIL ENGINEERING), B.Tech.+M.Tech. Dual degree (CIVIL ENGINEERING)
(Effective from 2019-20 Admitted Batch)

IV Year – II Semester
CE4201   PROJECT WORK

The student shall submit a report based on project work and attend a formal viva-voce examination before a Committee comprising the Chairman, BOS, Head of the Department, Guide and the External Examiner.