DEPARTMENT OF CIVIL ENGINEERING

II / IV BTech (Civil Engineering)
&
II / IV BTech (Civil Engineering with Environmental Engineering Elective)
&
II / VI BTech + MTech (Civil Engineering)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

I – SEMESTER

Code No.	Course title	Scheme of Instruction				Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext.	Ses.		
CE2101	Mathematics - IV	4	-	-	4	3	70	30	100	4
CE2102	Mechanics of Solids	4	-	-	4	3	70	30	100	4
CE2103	Building Materials and Building Construction	4	-	-	4	3	70	30	100	4
CE2104	Surveying -I	4	-	-	4	3	70	30	100	4
CE2105	Fluid Mechanics –I	4	1	-	5	3	70	30	100	4
CE2106	Environmental Studies	4	-	-	4	3	70	30	100	4
CE2107	Engineering Mechanics	4	2	-	6	3	70	30	100	5
CE2108	Strength of Materials Laboratory	-	-	3	3	3	50	50	100	2
CE2109	Survey Field Work	-	-	3	3	3	50	50	100	2
Total		**28**	**3**	**6**	**37**		**590**	**310**	**900**	**33**

DEPARTMENT OF CIVIL ENGINEERING

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Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

II – SEMESTER

Code No.	Course title	Scheme of Instruction				Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext	Ses		
CE2201	Structural Analysis - I	4	1	-	5	3	70	30	100	4
CE2202	Reinforced Concrete Structures - I	4	1	-	5	3	70	30	100	4
CE2203	Surveying -II	4	-	-	4	3	70	30	100	4
CE2204	Building Planning and Design	2	-	3	5	3	70	30	100	4
CE2205	Fluid Mechanics - II	4	1	-	5	3	70	30	100	4
CE2206	Environmental Engineering- I	4	-	-	4	3	70	30	100	4
CE2207	Fluid Mechanics Laboratory - I	-	-	3	3	3	50	50	100	2
CE2208	Total Station and Geomatics Lab	-	-	3	3	3	50	50	100	2
Total		**22**	**3**	**9**	**34**		**520**	**280**	**800**	**28**

DEPARTMENT OF CIVIL ENGINEERING

III / IV BTech (Civil Engineering)
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&
III / VI BTech + MTech (Civil Engineering)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

I – SEMESTER

Code No.	Course title	Scheme of Instruction				Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext	Ses		
CE3101	Structural Analysis – II	4	1	-	5	3	70	30	100	4
CE3102	Steel Structures – I	4	1	-	5	3	70	30	100	4
CE3103	Water Resources Engineering - I	4	1	-	5	3	70	30	100	4
CE3104	Geotechnical Engineering- I	4	1	-	5	3	70	30	100	4
CE3105	Environmental Engineering –II	4	-	-	4	3	70	30	100	4
CE3106	Professional Elective-I	4	-	-	4	3	70	30	100	4
CE3107	Geotechnical Engineering Lab-I	-	-	3	3	3	50	50	100	2
CE3108	Environmental Engineering lab	-	-	3	3	3	50	50	100	2
CE3109	Soft Skills			3	3	-	-	100	100	2
CE-M1	MOOC – I	-	-	-	-	-	-	100	100	2
Total		**24**	**4**	**9**	**37**		**520**	**480**	**1000**	**32**

DEPARTMENT OF CIVIL ENGINEERING

III / IV BTech (Civil Engineering)
&
III / IV BTech (Civil Engineering with Environmental Engineering Elective)
&
III/ VI BTech + MTech (Civil Engineering)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

II – SEMESTER

Code No.	Course title	Scheme of Instruction				Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext	Ses		
CE3201	Reinforced Concrete Structures - II	3	2	-	5	3	70	30	100	4
CE3202	Steel Structures – II	3	2	-	5	3	70	30	100	4
CE3203	Geotechnical Engineering-II	4	1	-	5	3	70	30	100	4
CE3204	Fluid Mechanics - III	4	1	-	5	3	70	30	100	4
CE3205	Transportation Engineering -I	4	-	-	4	3	70	30	100	4
CE3206	Professional Elective-II	4	-	-	4	3	70	30	100	4
CE3207	Concrete Lab	-	-	3	3	3	50	50	100	2
CE3208	Geotechnical Engineering Lab – II	-	-	3	3	3	50	50	100	2
CE3209	Fluid Mechanics Lab - II	-	-	3	3	3	50	50	100	2
CE-M2	MOOC - II	-	-	-	-	-	-	100	100	2
Total		**22**	**6**	**9**	**37**		**570**	**430**	**1000**	**32**

DEPARTMENT OF CIVIL ENGINEERING

IV / IV BTech (Civil Engineering)
&
III/ VI BTech + MTech (Civil Engineering)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

I – SEMESTER

Code No.	Course title	Scheme of Instruction				Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext	Ses		
CE4101	Estimating and Quantity Surveying	4	2	-	6	3	70	30	100	5
CE4102	Transportation Engineering-II	4	-	-	4	3	70	30	100	4
CE4103	Project Planning and Management	4	-	-	4	3	70	30	100	4
CE4104	Water Resources Engineering- II	4	1	-	5	3	70	30	100	4
CE4105	Professional Elective – III	4	-	-	4	3	70	30	100	4
CE4106	Professional Elective – IV	4	-	-	4	3	70	30	100	4
CE4107	Transportation Engineering Lab	-	-	3	3	3	50	50	100	2
CE4108	Computer Applications in Civil Engineering (Lab)	-		3	3	3	50	50	100	2
CE4109	Irrigation Structures Design Drawing	-	-	3	3	-	50	50	100	2
Total		**24**	**3**	**9**	**36**		**570**	**330**	**900**	**31**

DEPARTMENT OF CIVIL ENGINEERING

IV / IV BTech (Civil Engineering)
&
IV / VI BTech + MTech (Civil Engineering)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

II – SEMESTER

Code No.	Course title	\	Scheme of Instruction			Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext	Ses		
CE4201	Estimating and Quantity Surveying	4	2	-	6	3	70	30	100	5
CE4202	Transportation Engineering-II	4	-	-	4	3	70	30	100	4
CE4203	Project Planning and Management	4	-	-	4	3	70	30	100	4
CE4204	Water Resources Engineering- II	4	1	-	5	3	70	30	100	4
CE4205	Professional Elective - III	4	-	-	4	3	70	30	100	4
CE4206	Professional Elective - IV	4	-	-	4	3	70	30	100	4
CE4207	Transportation Engineering Lab	-	-	3	3	3	50	50	100	2
CE4208	Computer Applications in Civil Engineering (Lab)	-		3	3	3	50	50	100	2
CE4209	Irrigation Structures Design Drawing +	-	-	3	3	-	50	50	100	2
Total		**24**	**3**	**9**	**36**		**570**	**330**	**900**	**31**

Code	Title of Course	L	T	P	Total	Univ. Exam. Hr	Univ. Exam. Marks	Sess.	Total Marks	Credits
CE400	Project Work*+	-	-	-	-	-	50	50	100	14
CE-M3	MOOC – III	-	-	-	-	-	-	100	100	2
CE-M4	MOOC – IV	-	-	-	-	-	-	100	100	2
	Total	-	-	-	-	-	**50**	**250**	**300**	**18**

*Half the number of students shall do the project work during the first semester (of fourth year of study) and the remaining half the number of students shall do the project work during the second semester (of fourth year of study)

+ Viva voce examination only.

DEPARTMENT OF CIVIL ENGINEERING

IV/ IV BTech (Civil Engineering with Environmental Engineering Elective)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

I – SEMESTER

Code No.	Course title	Scheme of Instruction				Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext	Ses		
CE4101	Estimating and Quantity Surveying	4	2	-	6	3	70	30	100	5
CE4102	Transportation Engineering-II	4	-	-	4	3	70	30	100	4
CE4103	Project Planning and Management	4	-	-	4	3	70	30	100	4
CE4104	Water Resources Engineering- II	4	1	-	5	3	70	30	100	4
CEE4105	Professional Elective -III	4	-	-	4	3	70	30	100	4
CEE4106	Professional Elective -IV	4	-	-	4	3	70	30	100	4
CE4107	Transportation Engineering Lab	-	-	3	3	3	50	50	100	2
CE4108	Computer Applications in Civil Engineering (Lab)	-		3	3	3	50	50	100	2
CE4109	Irrigation Structures Design Drawing +	-	-	3	3	-	50	50	100	2
Total		**24**	**3**	**9**	**36**		**570**	**330**	**900**	**31**

DEPARTMENT OF CIVIL ENGINEERING

IV / IV BTech (Civil Engineering with Environmental Engineering Elective)

Scheme of Instruction and Examination under CBCS
(with effect from 2015-16 Admitted Batch)

II – SEMESTER

Code No.	Course title	Scheme of Instruction				Scheme of Examination			Total Marks	Credits
		L	T	P	Total	Exam (hrs)	Ext	Ses		
CE4201	Estimating and Quantity Surveying	4	2	-	6	3	70	30	100	5
CE4202	Transportation Engineering-II	4	-	-	4	3	70	30	100	4
CE4203	Project Planning and Management	4	-	-	4	3	70	30	100	4
CE4204	Water Resources Engineering- II	4	1	-	5	3	70	30	100	4
CEE4205	Professional Elective -III	4	-	-	4	3	70	30	100	4
CEE4206	Professional Elective -IV	4	-	-	4	3	70	30	100	4
CE4207	Transportation Engineering Lab	-	-	3	3	3	50	50	100	2
CE4208	Computer Applications in Civil Engineering (Lab)	-		3	3	3	50	50	100	2
CE4209	Irrigation Structures Design Drawing +	-	-	3	3	-	50	50	100	2
Total		**24**	**3**	**9**	**36**		**570**	**330**	**900**	**31**

Code	Title of Course	L	T	P	Total	Univ. Exam.		Sess.	Total Marks	Credits
						Hr	Marks			
CE400	Project Work*+	-	-	-	-	-	50	50	100	14
CE-M3	MOOC - III	-	-	-	-	-	-	100	100	2
CE-M4	MOOC - IV	-	-	-	-	-	-	100	100	2
	Total	-	-	-	-	-	**50**	**250**	**300**	**18**

*Half the number of students shall do the project work during the first semester (of fourth year of study) and the remaining half the number of students shall do the project work during the second semester (of fourth year of study)

+ Viva voce examination only.

CE3106 (PE – I)

CE3106A : Remote Sensing and GIS
CE3106B : Introduction to Rock Mechanics
CE3106C : Elements of Coastal Engineering
CE3106D : Advanced Concrete Technology
CE3106E : Building Services and Maintenance

CE3206 (PE – II)

CE3206A : Finite Element Methods of Analysis
CE3206B: Ground Improvement Techniques
CE3206C: Marine Structures
CE3206D: Solid Waste Management
CE3206E: Irrigation Engineering

CE4105/4205 (PE-III)

CE4105A/4205A: Multi-Storied Structures
CE4105B/4205B: Earth Retaining Structures
CE4105C/4205 C: Hydraulic Structures
CE4105D/4205 D: Industrial Waste Treatment
CE4105E/4205 E: Industrial Structures
CE4105F/4205 F: Traffic Engineering and Management

CE4106/4206 (PE-IV)

CE4106A/4206A: Prestressed Concrete Structures
CE4106B/4206B: Airport Planning and Design
CE4106C/4206 C: Watershed Management
CE4106D/4206 D: Air Pollution and Control
CE4106E/4206 E: Geo-Environmental Engineering
CE4106F/4206 F: Bridge Engineering

CEE4205 (PE-III)

CEE4205A: Industrial Waste Treatment
CEE4205B: Occupational Health and Industrial Hygiene

CEE4206 (PE-IV)

CEE4206A: Air Pollution and Control
CEE4206B: Environmental Impact Assessment

CE2101: MATHEMATICS –IV

Subject: - Mathematics – IV   Subject Code – CE 2101

Course Outcomes

operate the differential operator 'del' to the scalar and vector point functions, Calculate the Gradient, Divergence and Curl, Vector normal to a surface, maximum rate of change of a scalar field, test whether two surfaces are to cut orthogonally or not. Find the rate per unit volume at which the physical quantity is issuing from a point, the rate of in flowminus out flow using the Divergence and the angular velocity of rotation at any point of the vector field using the Curl. • test whether the given motion is irrotational or rotational, whether a vector force acting on a particle is conservative or not • find out the potential function from a given vector field. • obtain the well-known Laplace and poisson equations from an irrotational field
understand to determine the work done by a force field and circulation using a Line integral find out the Line, Surface and Volume integrals - find the flux using surface integral and volumes using the volume integral double and triple integrals as these are used to find areas and volumes.
Know the methods of solving Linear and Nonlinear first order and first degree partial differential equations. solve the Linear Partial Differential Equations with constant coefficients (homogeneous and nonhomogeneous) and know the procedure for finding the complementary function and particular integrals
apply the method of separation of variables to obtain solutions of most of the boundary value problems involving Linear partial differential equations occurred in engineering studies solve, in particular the wave equations, heat equations and Laplace's equations in Cartesian and polar coordinates using the method of separation of variables
apply and extend the knowledge of Fourier transform techniques in solving several Initial andBoundary value problems of Engineering, such as in Conduction of heat/Thermodynamics,Hydraulics transverse vibrations of a string, oscillations of an elastic beam, bending of beams,electrical circuits, free and forced vibrations of a membrane and transmission lines, etc.

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: Scope and treatment as in "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.
4. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw Hill Company.
5. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.
6. Higher Engineering Mathematics by Dr. M.K.Venkataraman.

Subject: - Mechanics Of Solids   Subject Code – CE2102
Course Outcomes

1.	Compute the stresses, strains, and displacements in structures and their components due to the loads acting on them.
2.	Draw the diagrams indicating the variation of the key performance features like bending moment and Shear forces
3.	Assess stresses across section of the thin cylinders to arrive at optimum sections to withstand the internal pressure and Stresses on oblique planes
4.	Evaluate the slope and deflection of beams subjected to loads.
5.	Evaluate bending concepts and calculation of section modulus and for determination of bending and shear stresses developed in the beams due to various loading conditions.

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 – Hookes 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 – Principle 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.

References:
(1)   Elements of strength of materials by Timoshenko and Young.

(2)   Introduction to mechanics of solids by Popov.
(3)   Structural Analysis by Pundit & Gupta
(4)   Strength of materials by Hyder.
(5)   Elementary mechanics of solids by P.N. Singer and P.K. Jha.
(6)   Strength of materials by Ramamrutham.
(7)   Strength of materials by Vazirani and Ratwani.

CE 2103 BUILDING MATERIALS AND BUILDING CONSTRUCTION

Subject: Building Materials and Building Construction   Subject Code – CE 2103

Course Outcomes

1. Ability to know about different materials such as stones, bricks, Tiles, wood, asbestos, glass & paints and their classification, manufacture and structural requirements
2. Ability to know about types of cement, manufacturing process and tests on cement such as field and lab tests and uses of cement and admixtures.
3. Ability in understanding of various building components such as foundation, floors, types of roofs , doors, windows and the materials used in making.
4. Ability to know about the types of masonry, finishers and standard styles of stairs
5. Ability to know about the materials used in making of concrete such as cement and admixtures.

Bricks And Clay Products: Bricks: Sources and qualities of Brick Earth, Classification of Bricks, Manufacture of Bricks, including burning types, general qualities of Bricks as per IS code, tests for good bricks as per IS code, including field tests, special forms of Bricks and their uses. Clay Products: Various types of tile manufacturing and their uses, Earth-wares, Terra-cotta, stone ware, porcelain, glazing of tiles etc.

Wood, Wood Based Products: Wood: Classification of various trees, cross section details of trees, their general properties, various types of defects in wood and timber, Methods of seasoning and their importance, felling and conversion, various Mechanical Properties of timber, Decay of timber, preservation methods, common Indian trees and their uses. Wood based Products: Veneers, Plywood and its types, Manufacturing of Plywood, plywood grades as per IS code, Laminated wood, merits of plywood and laminated wood, Lamin Boards, Block Boards, Batten board, Hard board, Particle boards and Composite boards.

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 varnish, 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 & Tar : Availability and uses of asbestos, properties of asbestos, various types of asbestos, difference between asphalt & bitumen, Types, uses and properties of Asphalt & Bitumen, composition of coal tar, wood tar, mineral tar and Naphtha.

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

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 upto Two-Brick wall thickness – Partition walls – Different types of Block Masonry – Hollow concrete Blocks – FAL- G Blocks, Hollow Clay Blocks.

Roofing: Mangalore tiled Roof, RCC roof, Madras Terrace, Hollow Tiled Roof, Asbestos Cement, Fibre glass, Aluminium G.I. Sheet roofing's.

Trusses: King Post & Queen Post Trusses – Steel roof Truss for 12m 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.

Cements, Modern Renovation Materials: Cements: Natural and artificial cements, types of various artificial cements and their uses. Wet and dry process of manufacturing ordinary Portland cement (OPC), Chemical and Physical analysis of OPC, various field and Laboratory Tests on OPC as per IS code. Storing of cement in the field and godowns
Modern renovation materials: Cement bound, polymer cement bound and pure polymer bound materials, their properties & uses.

Concrete Technology And Mix Design: Polymer Concrete, Types of cement concretes, ingredients and their characteristics, Cement concrete properties and relevant tests, storage, batching, mixing & Transporting, placing & vibrating and curing. Concrete grades & mix designs upto M 20 as per IS code. Introduction to polymer concrete and it's uses.

References:

1. "Civil Engg. Materials", by Technical Teachers' Training Institute, Chandigarh, Tata-Mc Graw-Hill   Publishing Company Ltd., New Delhi.
2. "Materials of construction", by R.C. Smith, McGraw-Hill Company, New York.
3. "Engineering Materials", 5th edition, By Surindra Singh,, Konark Publishers Pvt. Ltd., New Delhi.
4. "Materials of construction", by D.N. Ghose, Tata-McGraw-Hill Publishing Company Limited..
5. "Engineering Materials", By Sushil Kumar, Metropolitan Book Co., Private Ltd., New Delhi.
6. "Engineering Materials" [Material Science], by Rangwala 'Charotar Publications'
7. "Concrete Technology Theory & Practice" by M.S. Shetty, 'S. Chand & Company Ltd.'
8. "Building Construction" Vol.II & III By W.B. Mckay, E.L.B.S. and Longman, London, U.K.
9.   "Building Materials" by S.K. Duggal New Age International Publishers.
10. "Building Construction" by B.C. Punmia. Laxmi Publications.
11. "Construction Technology" by R. Chudly Vols I & II 2nd Edition Longman, UK.

CE2104   SURVEYING – I

Subject: Surveying –I   Subject Code – CE 2104
Course Outcomes

1. Carry out preliminary surveying in the field of civil engineering applications such as structural, highway engineering
2. Student can able to calculate angular measurements using compass.
3. Understand the working principles of plane table surveying instruments
4. Estimate the levels and interpolate the levels on contours

Introduction: Classification and principles of surveying. Triangulation and Trilateration Earth as spheroid, datum, geoid, Azimuth, latitude, longitude, Map projections, scales, plans, & 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 systems 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-Interval, 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)

References:

1. Surveying By Dr. K.R. Arora, Standard Book House.
2. Surveying Vol. 1,2 and 3 – By Punmia, Standard Book House.
3. Surveying Vol. 1 and 2 – By S.K. Duggal, Tata Mc.Graw Hill Publishing Co.
4. Surveying: Theory & Practices by James M. Anderson and Edward M. Mikhail

CE2105 FLUID MECHANICS – I

Subject: Fluid Mechanics –I   Subject Code – CE 2105
Course Outcomes

1. Compute hydrostatic and hydrodynamic forces
2. Analyze and design Crest Gates and Lock Gates
3. Apply conservation laws to derive governing equations of fluid flows
4. Analyze and design simple pipe systems
5. Analyze and design out let for open tanks and design pipe network for two or more reservoirs

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 & Floatation – Archimedes Principle; Stability of Floating Bodies – Centre of Buoyancy, Metacentric Height and its Determination.
Liquids in Relative Motion – Pressure of Liquids in a Container Subjected to Linear Acceleration and Rotation.

Fluid Kinematics and Conservation of Mass: Types of Fluid Flow & Methods of Fluid Flow Analysis – Methods of Describing Fluid Motion; Types of Flow – Steady & Unsteady Flows, Uniform & Non-uniform Flows, free and forced vortex motions, Laminar & 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 & Three Dimensional Analysis of Flows.
Ideal Fluid Flow – Stream Function, Velocity Potential; Rotational & Irrotational Flows – Vorticity & 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.

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).

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

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

References:
1. Fluid Mechanics and Hydraulic Machinery, Modi, P.N. and S.M. Seth, Standard Book House.
2. Fluid Mechanics, Jain, A.K., Khanna Publishers.
3. Engineering Fluid Mechanics Kumar, K.L., S. Chand & Co. Ltd.
4. Engineering Hydraulics, Rouse, H., John Wiley & Sons Inc.
5. Mechanics of Fluids, Shames, I.H., McGraw-Hill Professional.

CE2106   ENVIRONMENTAL STUDIES (COMMON TO ALL BRANCHES)

Subject: Environmental Studies   Subject Code – CE 2106

Course Outcomes

1.	Gain knowledge on environment and structure, functions of various ecosystems
2.	Know the importance of renewable energy resources as alternative to nonrenewable resources
3.	Understand social and ethical values of biodiversity and need of its conservation
4.	Understand different ways of pollution of environment and its consequences
5.	Gain awareness on local and global issues
6.	Know various environmental legislative acts

Introduction: Definition, scope and importance. Measuring and defining environmental development; indicators.

Ecosystems : Introduction, types, characteristic features, structure and functions of ecosystems like Forest, Grass Land, Desert ,Aquatic (Lake, rivers and estuaries)

Environmental and Natural Resources Management: Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems. Forest resources: Use and over-exploitation, Mining and dams – their effects on forest and tribal people. Water resources: Use and over- utilization of surface and groundwater, Floods, droughts.Water logging and salinity.Dams –benefits and costs.Conflicts over Water.Energy resources Energy resources: Energy needs. Renewable and non renewable energy sources. Use of alternative energy sources. Impact of energy use on environment

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 bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity – Insitu and Ex-situ conservation.

Environmental Pollution –Local and Global Issues. Causes, effects and control measures. Air pollution. Indoor air pollution. Water pollution. Soil pollution. Marine pollution. Noise pollution. Solid waste management, composting, vermiculture. Urban and industrial waste, recycling and re-use. Nature of thermal pollution and nuclear hazards. Global warming. Acid rain. Ozone depletion.

Environmental Problems in India. Drinking water, sanitation and public health. Effects of the activities on the quality of environment. Urbanization. Transportation. Industrialization. Green revolution. Water scarcity and groundwater depletion. Controversies on major dams – resettlement and rehabilitation of people: problems and concerns. Rain water harvesting, cloud seeding and watershed management.

 Economy and Environment. The economy and environment interaction. Economics of development, preservation and conservation. Sustainability: theory and practices. Limits to growth. Equitable use of resources for sustainable life styles. Environmental Impact Assessment.

 Special issues and Environment. Population growth and environment. Environmental education. Environmental movements. Environment vs. Development.

Institutions and Governance. Regulation by Government. Monitoring and enforcement of Environmental regulation. Environmental acts. Water (Prevention and control of pollution) act. Air (Prevention and control of pollution) act. Environmental Protection act. Wild life Protection act. Forest conservation act. Coastal zone regulations. Institutions and policies relating to India. Environmental Governance.

International conventions: Stockholm Conference 1972. Earth Summit 1992. World Commission for Environmental Development (WCED)

Case Studies : Chipko movement,Narmada Bachav Andolan,Silent Valley Project,Madhura Refinery and Taj Mahal,Industrialisation of Patancheru,Nuclear reactor at Nagarjuna Sagar,Tehri dam,Ralegaon Siddhi (Anna Hazare),Kolleru lake. –aquaculture,Florosis in Andhra Pradesh.

Field work: Visit to a local area to document and mapping environmental assets –river / forest / grass land / 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, affluent treatment plants.

References:
1. Introduction to Environmental Science ,Y Anjaneyulu, B S Publications
2. Environmental Studies , Suresh K .Dhameja ,S K Kataria & Sons Publications
3. Environmental Studies ,Anindita Basak ,Pearson Education

CE2107 ENGINEERING MECHANICS

Subject: Engineering Mechanics   Subject Code – CE 2107

Course Outcomes

1.Determine the resultant forces, moment for a given system of forces and the ability to analyse and solve simple problems in mechanics.
2.Calculate the motion characteristics of a body subjected to a given force system
3.Analyze planar and spatial systems to determine the forces in members of trusses, frames and problems related to friction
4.Determine the centroid and second moment of area
5.Calculate the motion characteristics of a body subjected to a given force system

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 – on 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 – centroids and centres of gravity of composite bodies – Theorems of Pappus – Distributed Loads on Beams.

Moments of Inertia, Definition – Parallel axis theorm 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 of a line – 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.

References:
(1)   Engineering Mechanics by Singer.
(2)   Engineering Mechanics by Timoshenko and D.H. Young.
(3)   Engineering Mechanics by J.L. Meriam
(4)   Mechanics for Engineers Statics and Dynamics by F.B. Beer and E.R. Johnston
(5)   Applied Mechanics by I.B. Prasad.

CE2108   STRENGTH OF MATERIALS LABORATORY

Subject: -Strength of materials laboratory   Subject Code – CE 2108
Course Outcomes
1. Able to identify the strengths of different materials by performing necessary tests

STRENGTH OF MATERIALS LABORATORY

(1)   Tension test on Mild/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 beam for wood and steel.
(8)   Study of forces in coplanar force system.

CE2109   SURVEYING FIELD WORK – I

Subject: -Surveying Field work   Subject Code – CE 2109

Course Outcomes

1. To familiarize students with different surveying instruments and to calculate magnitude and direction of survey lines

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, by 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 & Three Point Problem. Finding the distance between inaccessible points by making use of plane table, its 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. & C.S. of a road profile.

 Preparation of contour plan for an open area by taking level of the site.

II/IV B.Tech (CIVIL) 2nd SEMESTER

CE2201   STRUCTURAL ANALYSIS – I

Subject: Structural Analysis I   Subject Code – CE 2201

Course Outcomes

1.	Students will able to Calculate deflections in statically determinate beams using different methods
2.	They enable to Calculate strain energy due to different types of forces and Calculate deflections in statically determinate portal frames and Trusses
3.	They can Analyze statically indeterminate beams.
4.	They enable to Calculate shear force and bending moment vary with application of moving loads.
5.	They enable to Analyze Thick Cylinders.

Deflections of Beams using (i) Moment area method, (ii) Conjugate beam method, (iii) Unit load method, (iv) Castigliano's theorm – 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 theorm –1. (b) Trusses (having 9 members or less) using (i) Unit load method, (ii) Castigliano's theorem-1.

Analysis of (a) fixed beams, (b) three span continuous beams using (i) Theorm 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.

References:
(1)   Structural Analysis By Pundit & Gupta.
(2)   Strength of Materials – Ramamrutham.
(3)   Elementary strength of materials – Timoshenko and Young.
(4)   Strength of materials – Singer.
(5)   Strength of materials – Jain and Arya.
(6)   Analysis and Design of structures – Vazirani and Ratwani

CE2202   REINFORCED CONCRETE STRUCTURES – I

Subject: **Reinforced Concrete Structures - I**   Subject Code – CE 2202

Course Outcomes

1.	Ability to design flexural members (beams)singly reinforced, doubly reinforced and flanged beams
2.	Ability to design one way and two way slabs
3.	Ability to design shear reinforcement and torsion reinforcement
4.	Abilty to design the compression members, short columns and long columns
5.	Ability to design the footing and staircase

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 by using SP 16 (Sessional Work Only). Design of flanged beams (T and L), Effective flange width, Basis of analysis and design, Minimum and Maximum steel in flanged beams, SP 24 in design of beams.

Design of one way and two way slab : 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. Load from slabs on supporting beams. Different kinds of loads on slabs including partition walls, Shear in slabs.

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. Short columns subjected to uniaxial and biaxial moments.

Footings : Analysis and design of isolated Square and rectangular footings.
Design of stair case.

TEXT BOOKS :
   1. Limit State of Design of Reinforced Concrete – P. C. Vergheese
   2. Reinforced Concrete Limit state Design – A.K. Jain.
   3. R.C.C Design – Unnikrishna Pillai and Vasudeva Menon.
References:
   1. Reinforced Concrete Limit state Design, P. Dayaratnam
   2. Reinfoeced Concrete Structures by R Park and Paulay

CE2203   SURVEYING – II

Subject: **Surveying –II**   Subject Code – CE 2203

Course Outcomes

1. To study the different techniques of measurements of distances, directions and elevations and to understand about errors in measurements and their adjustments in a traverse .
2. To get introduced to different geodetic methods of survey such as triangulation, trigonometric leveling
3. To understand the basics and elements of different types of curves on roads and their preliminary survey and the techniques of layout of curves in transportation engineering.
4. To learn about the principles involved in the advanced surveying instrument i.e Total Staion.
5. To get introduced to modern advanced surveying techniques involved such as Remote sensing, Total station, GPS, Photogrammetry etc.

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 – gales traverse table or Trigonometric leveling – Elevation of top of the tower – same plane – Different planes – Axis signal correction.

Tacheometry – Principle of tachometry – Stadia methods – Fixed hair method – Movable hair method – Tangential method – Subtanse 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 – Rankines 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's – Introduction, Errors in GPS, Positioning methods, classification of GPS surveying, applications, advantages and disadvantages, photogrammetric surveying; sensors & platforms, aerial photogrammetry, Satellite images resolution, concept of stereo models, photogrammetric products, rectified images, orthophotography, topographic map, digital maps, DEM, GIS, Advantages & Disadvantages of photogrammetric surveying.

References:
1. Surveying By Dr. K.R. Arora, Standard Book House.
2. Surveying Vol. 1,2 and 3 – By Punmia, Standard Book House.
3. Surveying Vol. 1 and 2 – By S.K. Duggal, Tata Mc.Graw Hill Publishing Co.
4. Principles of GIS for land resource assessment by P.A. Burrough – Clerendon Press, Oxford.
5. Surveying: Theory & Practices by James M. Anderson and Edward M. Mikhail

CE2204   BUILDING PLANNING AND DESIGN

Subject: **Building Planning and Design**   Subject Code – CE 2204

Course Outcomes

1. Describe residential building parameters
2. Describe Climatic effects on buildings and draw floor plan of a house.
3. Design and draw Plan, elevation, sections of single, two, three bedroom houses. And design and draw individual rooms with functional, and furniture requirements.
4. Draw plan, elevation, sections of houses for Hot and Humid zones.

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

Preliminery Drawings : (a) Conventional signs of materials various equipment used in a Residen- tial Building (copying exercise) (b) Plan section and Elevation of a small House (one room and varandah) (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 Byelaws of Residential Buildings;
(b) Auto Cad 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.)

References:
1. Building Planning and Drawing by Dr.N. Kumara Swamy and A.Kameswara Rao, Charotar Publishing House.
2. Building Planning Drawing and Scheduling by Gurucharansingh and Jagadish Singh, Standard Publishers Distributors.
3. Civil Engineering Drawing Series 'B' by R.Trimurty, M/S Premier Publishing House.
4. 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, New Delhi.

CE2205 FLUID MECHANICS – II

Subject: **Fluid Mechanics** - II   Subject Code – CE 2205

Course Outcomes

1.Develop a basic knowledge of viscous flows in general.
2.Evaluate the velocity profiles of laminar and turbulent boundary layers growing on a plate.
3.Examine drag on a bluff body and different shapes of a bodies.
4.Analyze the momentum loss of the fluid in the boundary layers to the friction drag on a body.
5. Develop a basic knowledge of open channel flow relationships by applying fluid properties, and the conservation equations for mass, momentum, and energy. Evaluate relationships for hydraulic jumps and gradually-varying flows.

Viscous Effects on Fluid Motion: Navier-Stokes Equations (No Derivation) – N.S. equations for standard cases of Plane two Dimensional and Axisymmetric Flows.

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, Quantitative Description of Turbulence, Statistical Nature of Turbulent Flow, Isotropic and Homogeneous Turbulence.
Analysis of Turbulent Flows – Shear Stress due to turbulence – Semi-empirical Theories, Boussinesq Eddy Viscosity Model, Prandtl Mixing Length Concept; Velocity distribution for hydrodynamically smooth and rough pipes; Variation of Friction Factor in turbulent flow; Friction Factor for commercial pipes – Moody diagram.

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 & Propulsion – Effect of Circulation in Irrotational Flow, Generation of Lift around a Cylinder, Magnus Effect, Computation of Lift Force; Lift on Airfoil – Lift Coefficient and its Variation with Angle of Attack, Joukowsky Profile, Polar Diagram, Stall; Induced Drag.

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 jump, Hydraulic jump in horizontal rectangular Channels; Surges.

References:
1. Fluid Mechanics and Hydraulic Machinery, Modi, P.N. and S.M. Seth, Standard Book House.
2. Fluid Mechanics, Jain, A.K., Khanna Publishers.
3. Engineering Fluid Mechanics, Kumar, K.L., S. Chand & Co. Ltd.
4. Flow in Open Channels, Subramanya, K., Tata McGraw-Hill Publishing Co. Ltd.
5. Flow through Open Channels, Ranga Raju, K.G., Tata McGraw-Hill Publishing Co. Ltd.
6. Open Channel Hydraulics, Chow, V.T.,McGraw-Hill Ltd.

CE2206 ENVIRONMENTAL ENGINEERING – I

Subject: **ENVIRONMENTAL ENGINEERING – I**   Subject Code – CE 2206

Course Outcomes

CO1.	Understand the sources of water, quality of water, types of water borne diseases.
CO2.	Learn to estimate demand for water supply, and can apply the physical principles of flow in water distribution networks and pumping stations
CO3.	sign water treatment systems and operations and working of different units.
CO4.	Design elements of public water systems, pumping and transportation of water, distribution systems, and components of water supply network in a town/city, functioning of water/sewer pipe appurtenances.

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.

References:
1. Environmental Engineering – Peavy, Rowe, Tchenobolus
2. Elements of Environmental Engineering – K.N. Duggal
3. Water Supply and Sanitary Engineering – G.S.Birdie and J.S.Birdie
4. Water Supply Engineering – Dr. P.N.Modi
5. Water Supply and Wastewater Engineering – Dr. B.S.N.Raju
6. Water Supply Engineering – B.C. Punmia
7. Water Supply Engineering – Hussain
8. Water Supply Engineering – Chatterjee

CE2207   FLUID MECHANICS LABORATORY – I

Subject: -Fluid mechanics laboratory-I   Subject Code – CE 2207

Course Outcomes

1. Able to predict the coefficient of discharges for flow through pipes and experiments with flow measurements devices.

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. Study of floating body and determination of Metacentric Height.
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.

CE2208 TOTAL STATION AND GEOMATICS LAB

Subject: - Total station & Geomatics laboratory   Subject Code – CE 2208

Course Outcomes

1. Able To use different advanced surveying instruments and to calculate magnitude, altitude, angles and distances in the field

1. Measurement of Horizontal Angles by Repetition & Reiteration, Measurement of Vertical Angles, Heights & Distances
2. Distance between two in-accessible points by theodolite
3. Tachometry
4. Setting out curve by deflection angle method by 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 & volume measurement using total station
10. GIS related surveying applications

CE3101   STRUCTURAL ANALYSIS – II

Subject: **Structural Analysis – II**   Subject Code – CE 3101

Course Outcomes

1.	How do I apply my mechanics knowledge in a practical analysis? Perceive ability to analyze different types of trusses.
2.	Apply various methods to analyze different types of indeterminate frames.
3.	Comment on the behavior of structures with respect to different conditions, ability to analyze different types of arch structures.
4.	Ability to analyze cable and suspension bridges with different loading and support conditions.
5.	Ability to solve statically indeterminate structures using matrix (stiffness and flexibility) method.

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 theorm – II.

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, (iv) Column Analogy.

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.

References
1. Statically indeterminate structures – C.K. Wang
2. Structural analysis – A matrix approach – G.S. Pandit and S.P. Gupta.
3. Indeterminate Structures by R.l. Jindal
4. Indeterminate Structural Analysis by J.S. Kinney.

CE 3102   STEEL STRUCTURES – I

Subject: **Steel Structures – I**   Subject Code – CE 3102

Course Outcomes

1. Design of Bolted connections
2. Design of welded connections and tension members
3. Design of compression members
4. Design of Beams, roof trusses , column bases and concept of pre-engineered structures

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 prosperities 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 and advantages, disadvantages.

References:
1. Design of Steel structures by N. Subramanian, Oxford University Press.
2. Limit State Design of steel structures – Ramchandra and Virendra Gehlot, Scientific Publishers (India)
3. Limit State Design of steel structures by S.K.Duggal, McGraw Hill Education Private Ltd.
4. Design of steel structures by K.S.Sai Ram, Pearson Education India.
5. Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK International Publishing House, Bangalore – 560 001.

CE3103   WATER RESOURCES ENGINEERING – I

Subject: **Water Resources Engineering - I**   Subject Code – CE 3103

Course Outcomes

1.	Explain various components of hydrologic cycle that affect the movement of water in the earth.
2.	Illustrate the concepts of movement of ground water beneath the earth.
3.	Negotiate necessary investigations required for planning of a reservoir.
4.	Generalize the basic requirements of irrigation and various irrigation techniques, requirements of the crops.
5.	Evaluate the distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design.

INTRODUCTION AND 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 Evapotranspiration – 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.

GROUND WATER 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 & 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.

References:
1. Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi   Publications Pvt. Ltd.
2. Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers.
4. Engineering Hydrology, Subramanya, K., Tata McGraw-Hill Education Private Limited.
5. Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.
6. Impacts of climate change and climate variability on hydrological regimes, Jan C. van Dam, Cambridge University Press.
7. Hydrology: Principles, Analysis and Design, Raghunath, H.M.,New Age International.
8. Raghunath, H.M., Ground Water, New Age International.

CE3104   GEOTECHNICAL ENGINEERING – I

Subject: **Geotechnical Engineering- I**   Subject Code – CE 3104

Course Outcomes

1.	Understand the origin of the soil and geological cycle, apply principles of phase diagram for soil properties and perform basic weight-volume calculations. And understand consistency of soil- atterberg limits. Understand and use AASHTO, Unified and IS soil classification systems for soil classification.
2.	Understand basics of soil permeability and Darcy's law, seepage in soil, quicksand condition, and permeability tests. Understand how stresses are transferred through soils and be able to compute both geostatic and induced stresses due to point, line and area loads.
3.	Describe the general principles of compaction, factors affecting compaction, the field compaction and determine maximum dry unit weight and optimum water content.
4.	Estimate the amount of consolidation and settlement and time required for settlement under a given load.
5.	Basic knowledge of shear strength principles including the Mohr- Coulomb failure criterion.

Introduction: Historical development, 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 : Determination and consistency indices, Activity.

Mechanical analysis and Soil Classification : Sieve analysis, stoke's law, hydrometer and Pipette Analysis Textural Classification, Structural 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, pumping 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: Bousinesq's theory for determination of vertical stress, assumptions and validity, extension to Line, Strip, rectangular and circular loaded areas, Pressure Bulb and Influence diagrams, westergaard's theory, Newmarks influence chart - construction and use, 2:1 approximate method, contact pressure distribution beneath footings.

Compaction: Mechanism of compaction, Factors effecting compaction : water content, compactive effort, Type of soil. IS Light and IS Heavy 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. Terzaghi's one dimensional consolidation theory - assumption, derivation of differential equatuion and Solution, Oedometer Test, Determination of coefficient of consolidation by time fitting methods, initial compression, primary compression and secondary compression, determination of preconsolidation pressure. Normally consolidated, over consolidated and under consolidated clays.

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 on drainage conditions, shear strength of sands, critical void ratio and dilatancy, Liquefaction of soils, Factors affecting shear strength of clays and sands, Total stress analysis and Effective stress

analysis, skemptons pore pressure coefficients, Stress Paths.

<u>TEXT BOOKS</u> :

1. Soil Mechanics and Foundation Engineering by K.R. Arora.
2. Basic and Applied Soil Mechanics by Gopal Rajan and A.S.R. Rao.
3. Geotechnical Engineering by P. Purushothama Raj

CE3105   ENVIRONMENTAL ENGINEERING – II

Subject: **Environmental Engineering –II**   Subject Code – CE 3105

Course Outcomes

1.	Understanding of various sewerage systems and their suitability
2.	Design sewer and drainage systems layout for communities. Plan and implement house plumbing work effectively.
3.	Determine waste water quality parameters and their characteristics.
4.	Understand relevant wastewater treatment processes, their design criteria and applicability
5.	Make decisions regarding the treatment plant site selection, operation and maintenance and the need of advanced treatment.

Introduction to sanitation – systems of sanitation – relative merits & demerits – collection and conveyance of waste water – 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-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 operation-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,.

References:
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, by Garg, S.K. Khanna Publishers
4. Sewage treatment and disposal by Dr. P.N. Modi.
5. Water supply and Waste Water Engineering by Dr. B.S.N. Raju

PE I : CE3106A: REMOTE SENSING AND GIS

Subject: RS & GIS (PE-I)   Subject Code – CE 3106 A

Course Outcomes

1. Understand the remote sensing process
2. Understand digital data in different and their formats
3. Know about spatial data analysis
4. GIS application in various Engineering problems

Remote Sensing: Introduction, Basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Sensors- types and characterstics, passive sensor, active sensor, platforms-airborne remote sensing, spaceborne 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. Lillesand and Ralph W. Kiefer, John Wiley and   Sons Inc.
2. GIS by Kang tsung chang, TMH Publications & Co.,

REFERENCES:
1. Remote Sensing and its applications by Dr George Joseph.
2. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
3. Principles of Geographical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.

PE I : CE3106D: ADVANCED CONCRETE TECHNOLOGY

Course Name: ADVANCED CONCRETE TECHNOLOGY   **COURSE CODE:-** CE3106D

Course Outcomes:

CO1.	To summarize the concrete ingredients and its influence and to generalize the concepts of conventional concrete and its differences with other concretes like no fines, light weight etc., mechanical properties.
CO2.	To simulate several parameters affecting the stability and durability of concrete.
CO3.	To prioritize the significance of durability on concrete and its effect in various cases of natural /artificial attacks.
CO4.	Grade the concrete, estimate its quantity using mix design process, and describe the application and use of fiber reinforced concrete, self-compacting and high performance concrete.

Chemical and mineral admixtures: Water reducers, air entrainers, set controllers, specialty 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.

References:
1. Properties of Concrete, A.M.Neville, Longman 1995.
2. Concrete micro-structure, Properties and Materials, P.K.Mehta, J.M.Monteiro, Printice Hall INC & McGraw hill, USA.
3. Concrete Technology Theory and Practice, M.S.Shetty, S.Chand & Company Ltd, New Delhi.

CE3107   GEOTECHNICAL ENGINEERING LABORATORY – I

Subject: - Geo-Technical Engineering lab-I   Subject Code – CE 3107

Course Outcomes
   1. Able to classify the soil and identify different properties of soil by performing necessary tests.

   1. Atterberg limits
   2. Field density by Core Cutter and Sand replacement method.
   3. Grain size analysis
   4. Hydrometer/pipette analysis.
   5. Specific gravity by pycnometer/density bottle method.
   6. Permeability of soil – Constant and variable head tests.
   7. IS light compaction.

DEMONSTRATION EXPERIMENTS:

   1. Consolidation test.
   2. Quick sand model and others if any.

CE3108   ENVIRONMENTAL ENGINEERING LABORATORY-1

Subject: -Environmental Engineering lab   Subject Code – CE 3108
Course Outcomes
 1.   Able to analyze amount of minerals present in water by using suitable techniques.

 CO- PO Mapping

   1.   (a) p^H.
        (b) Conductivity.

   2.   (a) Turbidity.
        (b) Jar Test .

   3.   Hardness.
   4.   Acidity estimation.
   5.   Alkalinity estimation.
   6.   Available Chlorine & Residual Chlorine.
   7.   Fluorides.
   8.   Iron Estimation.
   9.   Estimation of Total Solids : Settleable Solids : Suspended solids, dissolved
        solids.
   10. D.O.
   11. B. O. D.
   12. C. O. D.
   13. Chlorides.

CE3109 SOFT SKILLS (COMMON WITH OTHER BRANCHES)

Subject: -soft skills   Subject Code – CE 3109

Course Outcomes
1. By the end of this course, the student will acquire and be efficient in all the four skills of language i.e Listening, Speaking, Reading and Writing.

Communication:
> Importance of communication
> Non verbal communication
> Personal appearance Gestures
> Facial expressions
> Eye contact
> Space distancing

Goal setting:
> Immediate, short term, long term,
> Smart goals, strategies to achieve goals

Time management:
> Types of time
> Identifying time wasters
> Time management skills

Leadership and team management:
> Qualities of a good leader
> Leadership styles
> Decision making
> Problem solving
> Negotiation skills

Group discussions:
> Purpose (Intellectual ability, creativity, approach to a problem, solving, tolerance, qualities of a leader)
> Group behaviour, analysing performance

Job interviews:
> Identifying job openings
> Preparing resumes & CV
> Covering letter
> Interview (Opening, body-answer Q, close-ask Q),
> Types of questions

Reference books:
1. 'Effective Technical Communications' by Rizvi M. Ashraf, McGraw–Hill Publication
2. 'Developing Communication Skills' by Mohan Krishna & Meera Banerji, Macmillan
3. 'Creative English for Communication' by N.Krishnaswami & T.Sriraman, Macmillan
4. 'Professional Communication

CE3201   REINFORCED CONCRETE STRUCTURES – II

Subject: **Reinforced Concrete Structures - II**   Subject Code – CE 3201

Course Outcomes

1.	Carryout analysis and design of different types of retaining walls.
2.	Design for circular and rectangular water tanks in reinforced concrete structures
3.	Design of reinforced concrete bridges
4.	Produce the drawings pertaining to different components of piles reinforced concrete structures.
5.	Ability to employ the code of prestressed for analysis of prestressed concrete structural members

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, Under ground rectangular tanks, Elevated rectangular and circular tanks, Design of these tanks for strength and cracking, 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 (casual reference to MOST drawings) Design of T-beam bridge deck slab, Longitudinal and Cross beams (casual reference to MOST drawings) 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 (Fressinet, 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.

References:
1. Limit State of Design of Reinforced Concrete – P.C. Vergheese
2. Reinforced Concrete Limit State Design – A.K. Jain.
3. Design of reinforced Concrete Structures – P. Dayaratnam

CE3202   STEEL STRUCTURES – II

Subject: **Steel Structures – II**   Subject Code – CE 3202

Course Outcomes

1.   Design of plate girders and stiffeners
2.   Design of bearings and bridges
3.   Design Concepts of water tanks
4.   Familiarize students with concept of plastic analysis

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 and through type bridges, Plate girder bridges, design of stringers, cross girders, wind bracings.

Bearings: Types of bearings, plate bearing, Rocker bearing, Roller bearing, Knuckle pin bearing. Water tanks, Introduction, Design of elevated circular and rectangular water tanks, Design of pressed steel 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.

References:
1.   Design of Steel structures by N. Subramanian, Oxford University Press.
2.   Limit State Design of steel structures – Ramchandra and Virendra Gehlot, Scientific Publishers (India)
3.   Limit State Design of steel structures by S.K.Duggal, McGraw HillEducation Private Ltd.
4.   Design of steel structures by K.S.Sai Ram, Pearson Education India.
5.   Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK International Publishing House, Bangalore – 560 001.

CE3203 GEOTECHNICAL ENGINEERING – II

Subject: **Geotechnical Engineering-II**   Subject Code – CE 3203

Course Outcomes

1.	Able to excavate the different soils and analyze the bearing capacity and settlement of shallow foundations.
2.	Analyze single and groups piles for lateral capacity and settlement of deep foundations
3.	Able to analyze types of well foundation and measures of rectifying tilts and shifts.
4.	Analyze lateral earth pressures theories of soil and Stability analysis of slopes and identify types of bulk heads and its use as retaining structures.

Subsoil Exploration : 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, Effec t 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, choice of type of foundations, Foundations on expansive soils.

Settlement Analysis : Causes of settlement, Computation of settlement, allowable settlement. Measures to reduce settlement.

Pile Foundations : Types, Construction, load carryig capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, 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 function, Grip length, problems in well sinking and remedial measures.

Stability Analysis of Slopes **:** Infnite 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, Rankines Active and passive earth pressure, Smooth Vertical wall with horizontal and inclined backfills. Coloumbs wedge theory, Culmans and Rebhanns graphical method for active earth pressure, Retaining walls: Types and Stability Analysis.

Bulkheads: Classification, Cantilever Sheet Piles in Sandy soils and clayey soils, Analysis of Anchored bulkheads – free earth support and fixed earth support methods.

TEXT BOOKS :
1. Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R. Rao
2. Foundation Analysis and Design – J. E. Bowles.
3. Soil Mechanics and Foundation Engineering – By K.R. Arora.
4. Foundation Engineering by P.C. Vargheese

Subject: **Fluid Mechanics - III**   Subject Code – CE 3204
Course Outcomes

1.Evaluate to perform dimensional analysis for problems in fluid mechanics.
2. Demonstrate to the Impact of jet on Turbines.
3. Evaluate the performance analysis in turbines and pumps and can be used in power plants
4. Analyze to identify and design the pumps with known specific speed and monomeric head.

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 and Pumps & 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 & Design Principles – Components & 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 & Design Principles – Components & 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 & 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.

References:
1. Fluid Mechanics and Hydraulic Machinery, Modi, P.N. and S.M. Seth, Standard Book House.
2. Fluid Mechanics, Jain, A.K., Khanna Publishers.
3. Engineering Fluid Mechanics Kumar, K.L., S. Chand & Co. Ltd.
4. Hydraulic Machines, Jagadish Lal, Metropoliton Book Company.

CE 3205   TRANSPORTATION ENGINEERING – I

Subject: Transportation Engineering -I   Subject Code – CE 3205

Course Outcomes

1.	Design highway geometrics.
2.	Design flexible and rigid pavements and Understand the principles of construction and maintenance of highways
3.	Design traffic signal systems
4.	Carryout the geometrical design of the airport infrastructure and Prepare structural designs of runway, taxiway, and apron-grate area

Highway Engineering – I : 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 – Wester guard equations, I.R.C. recommendations for design of concrete roads.

Highway Engineering – 3: Construction of roads – Earthen roads – W.B.M. roads – Bitumens roads – Cement concrete roads – Highway materials and their properties and tests. Maintenance of all types of roads – Highway drainage – Arborical culture – Street lighting.

Airport Engineering: Layout of Airports – Components functions – Aircraft characteristics – Airport site selection – Airport obstructions – Runway design – Visual aids – Air traffic control.

References:
1) Highway Engineering by Khanna & Justo.
2) Highway Engineering by Sharma & Sharma.
3) Airport planning and Design by Khanna & Arora.

PE II: CE3206B GROUND IMPROVEMENT TECHNIQUES

Subject: Ground Improvement Techniques (PE-II)   Subject Code – CE 3206 B

Course Outcomes

1.	Able to analyze the Densification of soils by different methods and Dewatering.
2.	Able to analyze soil by grouting how to reinforce the earth and to design.
3.	Able to analyze and use of Geotextiles in different conditions.
4.	Able to identify vibration and dynamic techniques for soil stabilization for different soils according to their requirements.

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, preloading or dewatering, drainwalls, sand drains, sand wicks, geodrains/banddrains, stone and lime columns, forced vaccum preconsolidation, thermal methods.

Grout injections, suspension and solution grouts, grouting equipment and methods, Applications. Reinforced Earth: Principles, components of reinforced earth, factors governing design of reinforced earth walls.

Geotextiles: Introduction, types of geotextiles; Functions and their application, tests for geotextile materials, geogrids, functions.
Mechanical stabilization: Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

Lime and Bituminous Stabilization: Types of admixtures, mechanism, factors affecting, design of mixtures, construction methods.

Stone columns, introduction, construction practice, design principles, vibrofloatation techniques and other techniques like dynamic replacement etc.

References:
1) Construction and Geotechnical Methods in Foundation Engineering, Robert M. Koerner : McGraw Hill.
2) Principles of pavement design, E. J. Yoder: John Wiley and sons.
3) Foundation Engineering, Leonards, G.A.
4) Highway Engineering Khanna S.K. and Justo C.E.G Nemchand Publications.
5) Introductory Soil Mechanics and Foundations. Sowers G.F.

PE II : CE3206 D: SOLID WASTE MANAGEMENT

Subject: Solid Waste Management (PE-II)   Subject Code – CE 3206 D

Course Outcomes

1.	Ability to define Solid Waste, classify its types and characteristics; explain problems due to improper solid waste disposal
2.	Ability to define SWM, its generation, identify collection methods of waste, list guidelines for route layout
3.	Explain transfer and transport of wastes
4.	Define Composting and Incineration, explain methods of composting and incineration, categorize advantages and disadvantages of composting and incineration.
5.	Explain disposal techniques of SW.

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 soilid 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.

References:
1. Integrated Solid Waste Management by Tchobanognous
2. Environmental Engineering by Howard S.Peavy, Donald R.Rowe and George Tchobanognous

CE3207   CONCRETE LABORATORY

Subject: -concrete laboratory   Subject Code – CE 3207

Course Outcomes

1. To study the properties of sand, coarse aggregate, cement and concrete and its applications.

CO- PO Mapping.

1) Specific gravity and unit weight of cement
2) 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) Fineness of cement.
6) Determination of compressive strength of cement (for different grades of cement).
7) 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.
11) Compressive Strength
12) Split tensile strength
13) Modulus of rupture
14) Design of concrete mix by using IS code method (for class work only)
15) Case studies on a) framed structures and b) plate girder brid

CE3208 GEOTECHNICAL ENGINEERING LAB. – I I

Subject: -- Geo-Technical engineering lab-II   Subject Code – CE 3208

Course Outcomes
1. To study the properties of sand, coarse aggregate, cement and concrete and its applications.

CO-PO Mapping

1. Field identification & classification of soils
2. Unconfined compression test
3. CBR test/plate bearing test
4. Triaxial compression test
5. Direct sheartest
6. Vane sheartest
7. Relative density
8. Triaxial test
9. Differential freeswell and swell pressure test.
10. Consolidated drained
11. Demonstration experiments (subject to availability)
12. S.P.T.
13. Consolidated undrained Foundation models
14. Plate load test
15. Pressuremeter test
16. Field vane shear.

CE3209   FLUID MECHANICS LABORATORY– II

Subject: -Fluid mechanics laboratory-II   Subject Code – CE 3209

Course Outcomes

1. Ability to understand the working of different fluid and hydraulic machines, examine the centrifugal & reciprocating pump.

1) Study of Characteristics of a hydraulic jump – To measure and draw $(E_1-E_2)/E_1$ vs F_1 and L_j / y_2 vs F_1, 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.
   (a) 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.
   (b)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.

CE4101/CE4201 ESTIMATING AND QUANTITY SURVEYING

Subject: **Estimating and Quantity Surveying**   Subject Code – CE 4101

Course Outcomes

1.	Estimate the cost of any building
2.	Design technical specifications for any project
3.	Invite tenders and arrange contracts on behalf of Govt.,
4.	Carry out rate analysis of various items in construction,
5.	Fix the value of built up properties and land, fixation of rent for a property,

Introduction : Standard units, Units of measurement of different items of work. Meaning of estimating. 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.

Specialisations : Meaning, purpose, types of specialisations, Method of preparation of specification, general specification, detailed specifications of different items of buildings and other structures – Race 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 shortwalls 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 earth work; different formulae for calculations, estimate of metalled road, Tar road, concrete road, Railway tract, Estimate of culverts and bridges etc. Valuation of buildings; purpose, different method of building valuation; different terms used in valuation and their meaning.

References:
1. Estimation, Costing, Specifications and Valuation in civil Engineering by M.Chakraborti.
2. Estimating and Costing in Civil Engineering by B.N. dutta.
3. Textbook of estimating and costing by G.S. Birdie.
4. Textbook on Estimating, Costing and Accounts by D.D. Kohli and R.C. Kohli.

CE4102 /CE4202 TRANSPORTATION ENGINEERING– II

Subject: **Transportation Engineering-II**   Subject Code – CE 4102

Course Outcomes

1.	Carry out the surveys for railways and Perform geometric design
2.	Plan the layout of different types of terminals
3.	Plan different cross sections of tunnel
4.	Design components of docks and harbours

Railway Engineering – 1 : Historical development of railways in India – Advantages of Railways – Classification of Indian Railways – Permanent way – Components and their functions – Rail joints – Welding of Rails – Creep of Rails – Rail fixtures & Fastenings.

Railway Engineering – 2 : Track Geometric design – Points & Crossings – Track drainage – Layout of Railway stations and yards – Signals – Interlocking – Track circuiting – Track Maintenance.

Dock & Harbour Engineering: Layout of Port components – Functions – Classification of Ports – Site selection – Natural Phenomenon – Tides, Winds, Waves, Currents – Drift – Navigational aids.

Tunnel Engineering: Alignment of tunnels – Cross-section of tunnels – Construction methods of Tunnels – Tunnel lining – Ventilation – Drainage – Muck disposal.

References:
1) Railway Engineering by S.C. Saxena & S. Arora.
2) Railway Engineering by Rangwala.
3) Dock & Harbour by Birdie.
4) Tunnelling by Rangwala.

CE4103 /CE4203   PROJECT PLANNING AND MANAGEMENT

Subject: Project Planning and Management   Subject Code – CE 4103

Course Outcomes

1.	Ability to understand the planning, scheduling & controlling of a particular project.
2.	Ability to Analyze the direct –indirect cost, operation time, process of updating of project work.
3.	.Ability to understand the importance of contract, its types, process of bidding.
4.	.Abilty to manage the work , its scope in construction work, quality of project manager
5.	Ability to understand the Acts : Workmen compensation Act 1923, Minimum Wages Act 1948.

PERT and CPM : Introduction : Origin of PERT and CPM, Planning, Scheduling and controlling Bar charts, Milestone charts, weaknesses in Barcharts, PERT and CPM networks – Comparison, Event, Activity, Rules for drawing networks, Numbering the events (Fulkerson's law : Dummy activities, Time estimate-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 path.

Cost analysis / updating / resource scheduling: Cost Analysis direct and indirect costs, operation time, Normal and crash points, optimising project cost, crash limit, Free float limit, Optimisation. Updating – Process of updating; when to update, Resource scheduling – Resource smoothening. Resource levelling, circle notation and arrow notation.

Contracts: Contracts – Element of contract, offer acceptance and consideration, valid contract, Department execution of works, Master Roll Form 21. Piece work Agreement form, work order; Contract system with tenders – Definitions – Contract ,Contractor, Quotation, Earnest money, Security money, Tender, Tender notice, Tender form, Bidding procedure, Irregularities in Bidding, award, Types of contracts – Lumpsum contract; Lumpsum and schedule contract, Item rate contract, sub-contracts, joint ventures, Areitration Disputes and claim settlement.

Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personnel Department.

Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

References:
1) PERT and CPM – L. S. Srinath.
2) PERT and CPM – Punmia.
3) Estimating and Costing – B.N. Dutta.
4) Construction Management and Planning – Guna and Sen Gupta, B.

CE4104 / CE4204   WATER RESOURCES ENGINEERING – II

Subject: **Water Resources Engineering- II**   Subject Code – CE 4104

Course Outcomes

1.	Basic Knowledge about types of of dams, factor effecting selection of dams, gravity dams
2.	Design of earth dams and spillways, failures and analysis
3.	Mainly it deals the design of reservoir, canals, diversion; storage head works by the Bligh's and Khosla's theory
4.	Understand about the types of fall in canals and its application which have designed in the all cases.
5.	It can develop the design principle of the types of spillways, and can able to design of aqueduct, siphon aqueduct and super passage, Introduce river training works and its types, water power engineering

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.

References:
1. Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd.
2. Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House.
3. Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers.
4. Hand book of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co.

PE-III: CE4105B /4205B: EARTH RETAINING STRUCTURES

Course Name: EARTH RETAINING STRUCTURES (PE-III)   PE-III: CE4105B /4205B

Course Outcomes:

CO1	Able to recognize different earth pressures and solve the problems accordingly.
CO2	Able to analyze design principles of retaining structures.
CO3	Able to understand design of sheet pile walls.
CO4	Able to understand the importance cellular coffer dams and braced cuts.

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, earth quack, 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.

Reference books:
1. Foundation design by W. C. Teng, Prentice Hall
2. Terzaghi. K. theoretical soil mechanics, John Willey 1965
3. Terzaghi. K. and Peck R. B. Soil mechanics in engineering and practice 2nd edition, John Wiley 1968.
4. Bowles. J. W. analysis and design of foundations, McGraw Hill, 4th edition 1955.
5. Embankment dams by Bharat Shing and S. D. Sharma
6. Earth and rock fill dams by Shearard, John willey
7. Design of small dams by U. S. B. R.
8. Earth manual by U. S. B. R.

PE-III: CE4105D/4205D INDUSTRIAL WASTE TREATMENT

Subject: **IWT** PE-III   Subject Code – CE 4105D

Course Outcomes:

CO1.	To understand the basic characteristics of wastewater
CO2.	Understand the kinetics of biological system.
CO3.	Able to design and working principle of various treatment methods
CO4.	Apply Environmental Management Systems to an industrial activity.
CO5.	Able to treatment and disposal of the industrial wastewater.

Characteristics of waste water of specific industries, characteristics of treatment plant effluents, Effect of waste water on self purification capacity of streams, Primary treatment of waste water.

Principles of biological waste treatment; Microbiological growth rate kinetic equations, sludge production, oxygen requirements, continuous flow treatment models. Aerobic treatment studies in continuous and semi-continuous reactors. Anaerobic treatment, studies, Nitrogen and Phosphoros removal.

Biological treatment facilities : Process designs of the following units w.r.t. Industrial Wastes; Activated sludge process; trickling filter; sludge degestion units; Aerated lagoons; Stabilization ponds (oxidation ponds); oxidation ditches (Paveer ditches); Rotating Biological contactor; Anaerobic filter.

Principles of Industrial waste Treatment : Waste reduction pretreatment of wastes, collection and seggregation of wastes, reduction in volume and strength neutralisation; equalisation; proportioning.

Manufacturing processes, flowsheets; Characteristics and treatment of wastes and disposal methods of the following industries – Sugar, Dairy, Distillery, Paper, Tannery, Textile, Sheet, Fertiliser, Oil refinery and Petrochemicals.

References:
1) Waste Water Treatment by M.N. Rao and A. K. Datta;

PE-IV: CE4106A /4206A: PRESTRESSED CONCRETE STRUCTURES

Subject: Prestressed concrete Structures (PE-IV) Subject Code – CE 4106A

Course Outcomes:

At the end of this course the student will be able to

1. To familarise students the concept of tensioning system
2. Ability to analyse prestress member
3. Ability to analyse losses in prestressed member
4. Ability to design the flexural members
5. Ability to analyse end block

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) Fressinet 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 prestress members, assumptions, pressure, or thrust line concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

Limit state design of flexural members, stress, 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.

References :

1) Prestressed Concrete by N.Rajagopalan.
2) Prestressed Concrete by P. Dayaratnam.
3) Design of Prestressed Concrete Structures by T.Y. Lin and Ned. H. Burns.

PE-IV: CE4106D /4206D AIR POLLUTION CONTROL

Subject: Air pollution & control (PE-IV)   Subject Code – CE 4106D

Course Outcomes
Able to identify different pollutants and their sources.
2. Able to estimate pollutants and their behavior
3. Able to know the effects of pollution on animals, plants and materials.
4. Able to know how to control the pollutants in different ways.

Air Pollution and its definition – Factors influencing air pollution – Classification of pollutants particulates – Gases-Sources of pollution – Air qualities standards – effects – Location of Industries.

Meteorology – Wind roses – lapses rates – mixing depth atmospheric dispersion – plume behaviour accumulation, estimation of pollutants – Effective stack height.

Air Pollution effects on human beings, animals, plants and materials – Air Pollution Episodes in India and abroad.

 Ambient air quality monitoring and stack monitoring.

Control of air pollution – Removal of pollutants – particulate and gaseous – Air pollution control equipments (units) such as setting chamber, cyclones, wet scrubbers/collectors, scrubbers, centrifugal scrubbers spary towers, packed beds, electrostatic precipitators, after burners-absorption – adsorption – Diffusion.

References:
1   Air Pollution Control Technology by T. Painter.
2   Elements of Air Pollution Control by Prof. T. Shivaji Rao.
3   Air Pollution Control by K.V.S.G. Murali Krishna.
4   Fundamentals of Air Pollution by Dr. B.S.N. Raju, Oxford & I.B.H.

CE4107 / CE4207 TRANSPORTATION ENGINEERING LABORATORY

Subject: -Transportation engineering lab   Subject Code – CE 4107

Course Outcomes

1. Able to identify weather aggregate and bitumen are used for road construction or not by performing necessary tests.

Testing of Aggregates: Specific gravity – Sieve Analysis – Shape test – Flakiness Index – Elongation Index – Angularity Number – Aggregate Crushing value – Impact value – Abrasion value – Stripping value & 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)

References: Highway material testing by Khanna & Justo.

CE4108 / CE4208 COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

Subject: - Computer Applications in civil engineering   Subject Code – CE 4108

Course Outcomes

1. Able to analyze the beams and trusses by using the Staad pro Software and solving some problems by using C Software.

Determination of 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.

Estimation of Run off 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 cohesion less soils.

Basic AUTO CAD commands application of drafting tools and modifying tools creation of 3 Dimensional solids. Application of STAAD Pro for the analysis and design of various structural components of Civil Engineering and Building Frames.

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Text Book:

1. Computer aided design-Software and Analytical tools by C.S. Krishnamoorthy & S. Rajesh.
2. Computer aided design in reinforced concete, V.L.Shah.