Civil Engineering Curriculum

E1 Sem1 Courses and Syllabus

Course Code:	Course Name: Engineering Mechanics	No. of Credits: 4

Detailed Syllabus:

Introduction of Engineering. Mechanics – Basic concepts System of Forces- Coplanar Concurrent Forces – Components in Space – Resultant- Moment of Forces and its Application – Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.

Friction: Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Motion of Bodies – Wedge, Screw jack and differential Screw jack.

Centroid and Center of Gravity: Centroids – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies - Area moment of Inertia: – polar Moment of Inertia – Transfer – Theorems - Moments of Inertia of Composite Figures - product of Inertia - Transfer Formula for product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia - Mass moment of inertia of composite bodies.

Kinematics: Rectilinear and Curve linear motion – Velocity and Acceleration – Motion of a Rigid Body – Types and their Analysis in Planar Motion.

Kinetics: Analysis as a particles and Analysis as a Rigid Body in Translation – Central Forces of motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies - Work–Energy Method - Equation for Translation - Work–Energy application to Particle Motion, Connected System- Fixed axis Rotation and Plane Motion.

TEXT BOOKS

1. Engineering Mechanics, by Ferdinand L. Singer Published by Harper Collins Publishers, Singapore.
2. Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao
3. Engineering Mechanics (Statics and Dynamics) by Arthur P. Boresi & Ridhard J. Schmidt – Thomson publications 2001.
4. Engineering Mechanics by A.K. Tayal, Umesh Publications
5. Engineering Mechanics – Schaum's series – McGraw-Hill Publications.
6. Engineering Mechanics by R.C. Hibbeler; Pearson education.

Course Code:	Course Name: Surveying-I	No. of Credits: 4

Detailed Syllabus:

Unit 1: Introduction to surveying

Introduction- Various types of surveying- based on methods and instruments, classifications;

Uses and necessity of geodetic surveying, photographic, astronomy and hydrographic surveying; Diagonal scale, various types of verniers, micrometers on surveying instruments, principles of surveying; Chain surveying, instruments required for linear measurement; Offsets-Perpendicular and Oblique offsets; Minor instruments for setting out right angle

Unit 2: Compass traverse surveying

Introduction, and Purpose, Compass: Principle, Bearings- fore and back bearing, compass – prismatic, surveyor, whole circle bearing and Quadrantal bearing; Reduced bearings, Local Attraction.

Unit 3: Plane Table Surveying

Definitions, uses and advantages, temporary adjustments. Different methods of plane table surveying. Two point problem. Errors in plane table survey, use of telescopic alidade.

Unit 4: Leveling and contouring

Leveling - Definitions, technical terms, different types of levels such as dumpy, quickset, precise, auto temporary and permanent adjustments of dumpy and auto level. Different methods of leveling, reduction of levels and problems. Difficulties in leveling work, corrections and precautions to be taken in leveling work.

Contour – definitions, contour interval, equivalent, uses and characteristics of contour lines, direct and indirect methods of contouring. Running a level line, L section, cross section, methods of interpolation. Grade contour- definition, use, setting out in field. Computation of volume by trapezoidal and prismoidal formula, volume from spot levels, volume from contour plan.

Unit 5: Theodolite & Theodolite traversing

Theodolite-various parts and axis of transit, technical terms, temporary and permanent adjustments of a transit, horizontal and vertical angles, methods of repetition and reiteration; Different methods of running a theodolite traverses, Gales' traverse table, balancing of traverse by Bow-Ditch's transit and modified transit rules;

Unit 6: Setting out works

General horizontal and vertical control, setting out of foundation plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite. Setting out of sewer line, culvert, use of laser for works. Setting out center line for tunnel, transfer of levels to underground work Project / route survey for bridge, dam and canal. Checking verticality of high

rise structures.

Course Code:	Course Name: Engineering Drawing	No. of Credits:

Detailed Syllabus:

INTRODUCTION TO ENGINEERING DRAWING : Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice & their Constructions -Conic Sections including the Rectangular Hyperbola (General method only) - Cycloid, Epicycloid and Hypocycloid - Involute. – Helices – scales used in engineering practice and representative fraction- the principals – construction of plain diagonal and vernier scales

DRAWING OF PROJECTIONS OR VIEWS ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY : Principles of Orthographic Projections – Conventions – First and Third Angle Projections of Points and Lines inclined to both planes, True lengths, traces.

PROJECTIONS OF PLANES & SOLIDS : Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes – Auxiliary Views. Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

MENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right Regular So
nder, Pyramid Cone and their parts. Interpenetration of Right Regular Solids – Intersection of Cylind
linder Vs Prism, Cylinder Vs Cone.

ISOMETRIC PROJECTIONS : Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

TRANSFORMATION OF PROJECTIONS : Conversion of Isometric Views to Orthographic Views –Conventions.

PERSPECTIVE PROJECTIONS : Perspective View : Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods(General Method only).
Introduction to Computer aided Drafting: Generation of points, lines, curves, polygons, simple solids, dimensioning.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhatt / Charotar
2. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishes
3. Engineering Drawing, Narayana and Kannaiah / Scietech publishers.
4. Engineering Drawing and Graphics, Venugopal / New age.
5. Engineering Drawing- Johle/Tata McGraw Hill.
6. Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International.

Course Code:	Course Name: Mathematics-I	No. of Credits: 4
Detailed Syllabus:		

Course Code:	Course Name: Geo Science	No. of Credits: 4

Detailed Syllabus:

INTRODUCTION: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology, Petrology and Structural geology.

WEATHERING OF ROCKS : Its effect over the properties of rocks importance of weathering with REFERENCE to dams, reservoirs and tunnels weathering of common rock like "Granite"

MINERALOGY: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnetite, and Bauxite.

PETROLOGY: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone,
Gneiss, Schist, Quartzite, Marble and Slate.

STRUCTURAL GEOLOGY: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils.

Ground water: Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas.

Landslides: their causes and effect; measures to be taken to prevent their occurrence. Importance of study of ground water, earth quakes and landslides.

Geophysical studies: Importance of Geophysical studies Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods

and Geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of competence of sites by grouting etc.

GEOLOGY OF DAMS AND RESERVOIRS: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factor's Contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs.

TUNNELS: Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. lithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXT BOOKS:

1. Principals of Engineering Geology by K.V.G.K. Gokhale – B.S publications
2. Engineering Geology by N. Chennkesavulu, Mc-Millan, India Ltd. 2005.
3. F.G. Bell, Fundamental of Engineering Geology Butterworths, Publications, New Delhi, 1992.
4. Krynine & Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution,

Course Code:	**Course Name:** Surveying-I Lab	**No. of Credits: 2**

Detailed Syllabus:

Course Code:	**Course Name:** Geo-Science Lab	**No. of Credits: 2**

Detailed Syllabus:

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
4. Simple Structural Geology problems.

E1 Sem2 Courses and Syllabus

Course Code:	**Course Name:** Mechanics of solids - I	**No. of Credits: 4**

Detailed Syllabus:

SIMPLE STRESSES AND STRAINS :

Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

STRAIN ENERGY – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

SHEAR FORCE AND BENDING MOMENT :
Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d. load., uniformly varying loads and combination of these loads – Point of contraflexure Relation between S.F., B.M and rate of loading at a section of a beam.

FLEXURAL STRESSES :
Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

SHEAR STRESSES :
Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

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

THIN CYLINDERS :
Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Thin spherical shells.

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

TEXT BOOKS:
1. Introduction to text book of Strength of materials by R.K. Bansal – Laxmi publications Pvt. Ltd., New Delhi.
2. Introduction to text book of Strength of Material by U.C. Jindal, Galgotia publications.
3. Strength of materials by R. Subramanian, Oxford university press, New Delhi
4. Mechanics of Solid, by Ferdinand Beer and others – Tata McGraw-Hill Publications 2000.
5. Strength of Materials by Schaum's out line series – McGraw-Hill International Editions.
6. Strength of Materials by S. Ramakrishna and R. Narayan – Dhanpat Rai publications.
7. Strength of materials by R.K. Rajput, S.Chand & Co, New Delhi.
8. Strength of Materials by A.R. Basu, Dhanpat Rai & Co, Nai Sarah, New Delhi.
9. Strength of Materials by L.S. Srinath et al., Macmillan India Ltd., Delhi.
10. Strength of Materials by Bhavikatti.

Course Code:	Course Name: Fluid mechanics	No. of Credits: 4

Detailed Syllabus:

INTRODUCTION : Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion.

HYDRO STATICS: pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers. Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems. Buoyancy- Meta centric height, conditions of Equilibrium of submerged Bodies.

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

FLUID DYNAMICS: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, (Navier – stokes equations (Explanationary) Momentum equation and its application – forces on pipe bend.

MEASUREMENT OF FLOW: Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal and Stepped notches - –Broad crested weirs.

CLOSED CONDUIT FLOW: Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart. Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

BOUNDARY LAYER THEORY: Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers no deviations BL in transition, separation of BL, control of BL, Flow around submerged objects-Drag and Lift- Magnus effect.

REFERENCES:

1. Fluid Mechanics & Hydraulic Machines by Modi and Seth, Standard book house.
2. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi

Publications (P) ltd., New Delhi

3. Introduction to Fluid Machines by S.K. Som & G. Biswas (Tata McGraw-Hill publishers Pvt. Ltd.)

4. Fluid Mechanics by Frank. M. White (Tata McGraw-Hill Pvt. Ltd.)

Course Code:	**Course Name:** Building materials and construction	**No. of Credits: 4**

Detailed Syllabus:

STONES, BRICKS AND TILES:

Properties of building stones – relation to their structural requirements. Classification of stones – Stone quarrying – precautions in blasting, Dressing of stone, Composition of good brick earth, various methods of manufacture of bricks. Comparison between clamp burning and kiln burning.

WOOD: Structure – properties – Seasoning of timber. Classification of various types of woods used in buildings – Defects in timber. Alternative materials for wood, Galvanized Iron, Fiber-reinforced plastics, steel, Aluminum.

CEMENTS & ADMIXTURES: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

HARDENED CONCRETE : Water / Cement ratio – Abram's Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.

ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

MIX DESIGN : Factors in the choice of mix proportions – Durability of concrete – Quality

Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

TEXT BOOKS:

1. Properties of Concrete by A.M. Neville – Low priced Edition – 4th edition
2. Concrete Technology by M.S. Shetty. – S.Chand & Co. ; 2004
3. Building material by S K Duggal – New Age International Publishers; Second Edition
4. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
5. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi

REFERENCES:

1. R.Chudly "Construction Technology "– Volumes I and II" 2nd Edition, Longman, UK, 1987.
2. Building materials by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi
3. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
4. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi

Course Code:	**Course Name:** Surveying - II	**No. of Credits: 4**

Detailed Syllabus:

Unit 1: Tacheometric surveying

Principles and uses, advantages, stadia formula, different methods of tacheometer, subtense bar method, location details by tacheometer, stadia diagram and tables, error and accuracy in tacheometry survey work Principles of surveying; Errors and their adjustment; Maps - scale, coordinate system; Distance and angle measurement - Leveling and trigonometric leveling;

Unit 2: Triangulation and Trilateration

Geodetic Surveying; Classification of Triangulation system, Triangulation figures and systems, Strength of figure, Reconnaissance, Inter-visibility of stations-signals and towers; Base line measurement- Calculation of length of base and corrections; Horizontal and vertical angles measurements; Satellite station – Reduction to centre; Extension of Base – Base net; Trilateration

Unit 3: Modern surveying instruments

Electronics in surveying, general principles used in the instruments. Auto levels, Digital Level. Electronic distance measurements - types, principles, applications of Total Station in surveying, corrections for field observations. Electronic digital theodolite – types, uses and applications, concept of total station. Use of computer in survey work for level computation and plotting contour plan.

Unit 4: Curves

Definitions of different terms, necessity of curves and types of curves. Simple circular curves and compound curves, office and field work, linear methods of setting out of curves. Angular methods

for setting out of curves, two theodolite and Rankine deflection angle methods. Reverse and transition curves, their properties and their advantages, design of transition curves, shift, spiral angle. Composite curves – office and field work, setting out of curve by angular method, composite curve problems.Vertical curves – definitions, geometry and types, tangent correction and chord gradient methods, sight distance on a vertical curve, difficulties in setting out curves and solutions for the same

Unit 5: Photogrammetry

scale, flying height; Remote sensing - basics, platform and sensors, visual image interpretation;

Basics of Geographical information system (GIS)- Geographical Information System-Information systems, spatial and non- spatial information, geographical concept and terminology, advantages of GIS, Basic component of GIS. Commercially available GIS hardware and Software.

Geographical Positioning system (GPS) - Global Positioning System (G.P.S)-G.P.S. Segments: Spaces Segment, Control Segment, User Segment, Features of G.P.S. Satellites, Principle of Operation, Surveying with G.P.S.: Methods of observations, Absolute Positioning, Relative Positioning, differential G.P.S. Heights and mean sea level Heights. Applications of G.P.S.

Unit 6: Hydrographic Surveying

Introduction – Shore line survey; Sounding – making the sounding; Methods of local sounding; Reduction and plotting of sounding; The tides, currents and waves – Prediction of tides, tide gauges, MSL as Datum

Text/Reference Books:

1. Surveying, Vol-1, 2 & 3, Dr. K.R. Arora; Rajsons Publications Pvt. Ltd.
2. Surveying and Leveling, Vol I & II, III, B.C.Punmia , Laxmi Publication
3. Surveying and Leveling, N N Basak, Tata McGraw Hill
4. Surveying, R Agor, Khanna Publishers
5. Concepts and Techniques of GIS, Lo C.P.Yeung A K W, Prentice Hall, India
6. Introduction to GIS, Kang-tsung Chang, Tata McGraw Hil

Remote sensing and GIS, K. Anjali Rao , BS Publications

Course Code:	**Course Name:** Mathematics - II	**No. of Credits: 4**

Detailed Syllabus:

Course Code:	**Course Name:** Mechanics of solids - I Lab	**No. of Credits: 2**
Detailed Syllabus: 1. Tension test 2. Torsion test 3. Hardness test 4. Spring test 5. Compression test on wood or concrete 6. Impact test		
Course Code:	**Course Name:** Surveying - II Lab	**No. of Credits: 2**
Detailed Syllabus:		
Course Code:	**Course Name:** Soft skills	**No. of Credits:**
Detailed Syllabus:		

E2 Sem1 Courses and Syllabus

Course Code:	**Course Name:** Structural analysis - 1	**No. of Credits:4**

Detailed Syllabus:

PROPPED CANTILEVERS : Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

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

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

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to

continuous beams with and without settlement of supports.

ENERGY THEOREMS : Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed trusses.

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

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

INDETERMINATE STRUCTURAL ANALYSIS : Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies –Solution of trusses with upto two degrees of internal and external indeterminacies –Castigliano's theorem

TEXT BOOKS:

1. Analysis of Structures-Vol I & Vol II by V.N. Vazrani & M.M.Ratwani, Khanna Publications, New Delhi.
2. Structural Analysis by V.D. Prasad Galgotia publications, 2nd Editions.
3. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi
4. Comprehensive Structural Analysis-Vol.I&2 by Dr. R. Vaidyanathan & Dr. P.Perumal- Laxmi publications pvt. Ltd., New
Delhi
5. Basic structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi
6. Mechanics of Structures by S.B. Junnarkar, Charotar Publishing House, Anand, Gujrat
7. Theory of Structures by Gupta, Pandit & Gupta; Tat McGraw – Hill Publishing Co.Ltd., New Delhi.
8. Theory of Structures by R.S. Khurmi, S. Chand Publishers
9. Strength of Materials and Mechanics of Structures- by B.C.Punmia, Khanna Publications, New Delhi.
10. Introduction to structural analysis by B.D. Nautiyal, New age international publishers, New Delhi

Course Code: CE3103	**Course Name:** Hydraulics	**No. of Credits:4**

Detailed Syllabus:

OPEN CHANNEL FLOW-I: Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's; and Bazin formulae for uniform flow – Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical sub-critical and super critical flows.

OPEN CHANNEL FLOW- II: Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles-direct step method- Rapidly varied flow, hydraulic jump, energy dissipation.

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

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

HYDRAULIC TURBINES – I: Layout of a typical Hydropower installation – Heads and efficiencies-classification of turbines Pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency.

HYDRAULIC TURBINES – II: Governing of turbines-surge tanks-unit and specific turbines-unit speed-unit quantity-unit power-specific speed performance characteristics-geometric similarity-cavitation.

CENTRAIFUGAL-PUMPS: Pump installation details-classification-work done- Manometric head-minimum starting speed losses and efficiencies-specific speed multistage pumps-pumps in parallel- performance of pumps-characteristic curves- NPSH-cavitation.

REFERENCES:

1. Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
2. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi
3. Open Channel flow by K. Subramanyam. Tata McGraw-Hill Publishers

Course Code:CE2202	**Course Name:** Water Resource Engineering - I	**No. of Credits:4**

Detailed Syllabus:

Introduction to engineering hydrology and its applications: Hydrologic cycle, types and forms

of precipitation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data.

Rainfall-evaporation & Infiltration: factors affecting evaporation, measurement of evaporation-evapotranspiration- Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices. Runoff-components of runoff, factors affecting runoff, stream gauging, effective rainfall, separation of base flow.

Hydrograph: Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph, S-hydrograph, IUH, Synthetic Unit Hydrograph.

Design Discharge: Computation of design discharge-rational formula, SCS method, flood frequency analysis-Gumbel's method, log pearson III method, basic concepts of flood routing-hydraulic and hydrologic routing, channel and reservoir routing.

Ground water Occurrence: types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, radial flow to wells in confined and unconfined aquifers.

Necessity and Importance of Irrigation: advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation, standards of quality for Irrigation water.

Soil-water-plant relationship: vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, estimation of consumptive use, Duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies.

Canals: Classification of canals, design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, canal lining.

REFERENCES:

1. Engineering Hydrology by Subramanyam
2. Irrigation and water power engineering by Punmia & Lal, Laxmi publications pvt. Ltd., New Delhi
3. Irrigation and Water Resources & Water Power by P.N. Modi, Standard Book House.

Course Code:MA2103	**Course Name:** Mathematics - III	**No. of Credits:4**

Detailed Syllabus:

Course Code:	**Course Name:** Mechanics of solids - II	**No. of Credits:4**

Detailed Syllabus:

PRINCIPAL STRESSES AND STRAINS :

Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

THEORIES OF FAILURES :

Introduction – Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

TORSION OF CIRCULAR SHAFTS :

Theory of pure torsion – Derivation of Torsion equations : T/J = q/r = N?/L – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

SPRINGS

Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

COLUMNS AND STRUTS :

Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

Laterally loaded struts – subjected to uniformly distributed and concentrated loads – Maximum B.M. and stress due to transverse and lateral loading.

DIRECT AND BENDING STRESSES :

Stresses under the combined action of direct loading and B.M,. core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

UNSYMETRICAL BENDING :

Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis Deflection of beams

under unsymmetrical bending.

BEAMS CURVED IN PLAN:
Introduction – circular beams loaded uniformly and supported on symmetrically placed Columns – Semi-circular beam simply-supported on three equally spaced supports.

ANALYSIS OF PIN-JOINTED PLANE FRAMES :
Determination of Forces in members of plane, pin-jointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses.- by method of joints, method of sections.

TEXT BOOKS:

1. A Text book of Strength of materials by R.K. Bansal –Laxmi Publications (P) ltd., New Delhi
2. Introduction to Strength of Materials by U.C. Jindal, Galgotia publications.
3. Strength of Materials by B.C. Punmia
4. Mechanics of Solid, by Ferdinand Beer and others – Tata McGraw-Hill Publications 2000.
5. Strength of Materials by Schaum's out line series – Mc. Graw hill International Editions.
6. Strength of Materials by S. Ramakrishna and R. Narayan – Dhanpat Rai publications.
7. Strength of materials by R.K. Rajput, S.Chand & Co, New Delhi.
8. Strength of Materials by A.R. Basu, Dhanpat Rai & Co, Nai Sarah, New Delhi.
9. Strength of Materials by L.S. Srinath et al., Macmillan India Ltd., Delhi.
10. Mechanics of Structures, by S.B. Junnarkar, Charotar Publishing House, Anand, Gujrat.

Course Code:	**Course Name:** Building Materials and Construction Lab	**No. of Credits: 2**

Detailed Syllabus:

1. Bulking of sand
2. Specific gravity of cement
3. Fineness of cement
4. Flow test for workability
5. Water absorption test for bricks
6. Soundness of cement
7. Initial and final setting of cement
8. Consistency of cement
9. Workability of concrete by slump cone test
10. Workability of concrete by VEE- BEE Consistometer test
11. Workability of concrete by compaction factor test

Course Code:	**Course Name:** Hydraulics Lab	**No. of Credits:2**

Detailed Syllabus:

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head

method.

4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Performance test on Pelton wheel turbine
8. Efficiency test on centrifugal pump.

E2 Sem2 Courses and Syllabus

Course Code:	Course Name: Design of concrete structures – I	No. of Credits: 4

Detailed Syllabus:

Introduction of Limit State Design : Concepts of limit state design – Basic statistical principles – Characteristic loads – Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of
Resistance

Beams : Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections.

Shear, Torsion and Bond : Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

Short and Long columns – under axial loads ,uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

Footings : Different types of footings – Design of isolated, square, rectangular and circular footings.

Slabs : Design of Two-way slabs, one way slab, continuous slab Using I S Coefficients .

Limit state design for serviceability - deflection, cracking and codal provision.

TEXT BOOKS:

1. Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata McGraw Hill, New Delhi.
2. Fundamentals of reinforced concrete by N.C. Sinha and S.K Roy, S. Chand publishers
3. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi
4. Limit State Design by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
5. Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private

Ltd., New Delhi.
6. Reinforced concrete structural elements – behavior, Analysis and design by P. Purushotham, Tata McGraw-Hill, 1994.
7. Design of concrete structures – Arthus H.Nilson, David Darwin, and Chorles W. Dolar, Tata McGraw-Hill,
3rd Edition, 2005.
8. Reinforced concrete structures, Vol.1, by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt.
Ltd., New Delhi
9. Reinforced concrete structures – I.C. Syal & A.K.Goel, S.Chand Publishers
10. Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, New Delhi.

Course Code:	**Course Name:** Structural analysis - II	**No. of Credits: 4**

Detailed Syllabus:

ARCHES : Three hinged arches, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending
moment, normal thrust and radial shear – effect of temperature.

TWO HINGED ARCHES: Determination of horizontal thrust bending moment, normal thrust and radial shear – Rib
shortening and temperature stresses, tied arches – fixed arches – (No analytical question). Approximate method of structural analysis , application to building frames. (i) Portal method (ii) Cantilever method.

Slope deflection method : Derivation of slope deflection equation of supports application to continuous beams including settlement of supports single bay, single sway, portal frame including side sway.

Moment Distribution method – Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – storey portal frames – including Sway-Substitute frame analysis by two cycle.

Analysis of continuous beams – including settlement of supports and single bay portal frames with side sway by Kani's method. Flexibility methods, Introduction, application to continuous beams including support settlements.

Stiffness method: Introduction, application to continuous beams including support settlements

TEXT BOOKS:

1. Analysis of Structures – Vol. I & 2 by Bhavikatti, Vikas publications
2. Analysis of structures by Vazrani & Ratwani – Khanna Publications.
3. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi
4. Comprehensive Structural Analysis-Vol.I&2 by Dr. R. Vaidyanathan & Dr. P.Perumal- Laxmi publications pvt. Ltd., New

Delhi
5. Structural Analysis (Matrix Approach) by Pundit and Gupta – Tata McGraw Hill publishers.
6. Theory of structures by Ramamuratam
7. Structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi

Course Code:	**Course Name:** Transportation engineering - I	**No. of Credits: 4**

Detailed Syllabus:

Unit I

Introduction: Modes of transportation, Importance of transportation, History of transportation, Highway development in India, Surveys for road construction.

Unit II

Geometric design: Road geometrics, Gradient, Camber, Sight distances, Design of horizontal curvature, Vertical curvature.

Unit III

Highway materials: Aggregates-desired properties and laboratory tests, bituminous materials-desired properties and laboratory tests, Mix design.

Unit IV

Pavement design: Types of pavements, Components of pavement, Flexible pavement design, and rigid pavement design.

Unit V

Traffic engineering: Fundamental parameters and relations, models, Traffic studies, at grade intersection and grade separated intersection

References:

1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 7th edition (2000).
2. Highway Engineering Design – L.R.Kadiyali and Lal- Khanna Publications.
3. Highway Engineering – S.P.Bindra, Dhanapat Rai & Sons. – 4th Edition (1981)

Course Code:	**Course Name:** Soil mechanics	**No. of Credits: 4**

Detailed Syllabus:

INTRODUCTION: Soil formation – soil structure and clay mineralogy – Adsorbed water – Mass- volume relationship – Relative density.

INDEX PROPERTIES OF SOILS: Grain size analysis – Sieve and Hydrometer methods – consistency limits and indices – I.S. Classification of soils

PERMEABILITY: Darcy's law- permeability – Factors affecting – laboratory determination of coefficient of permeability –Permeability of layered systems.

SEEPAGE THROUGH SOILS: Total, neutral and effective stresses –quick sand condition – Seepage through soils – Flow nets: Characteristics and Uses.

STRESS DISTRIBUTION IN SOILS: Boussinesq's and Westergard's theories for point loads and areas of different shapes – Newmark's influence chart .

COMPACTION: Mechanism of compaction – factors affecting – effects of compaction on soil properties. – Field compaction Equipment - compaction control.

CONSOLIDATION : stress history of clay; e-p and e-log p curves – magnitude and rate of 1-D consolidation – Terzaghi's Theory.

SHEAR STRENGTH OF SOILS: Mohr – Coulomb Failure theories – Types of laboratory strength tests – strength tests based on drainage conditions – Shear strength of sands – Critical Void Ratio – Liquefaction- shear strength of clays.

TEXT BOOKS:

1 Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt . Ltd, New Delhi

2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.

3. Soil Mechanics and Foundation by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi

REFERENCES:

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).

2. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, New york.

3. Geotechnical Engineering by Purushotham Raj

Course Code:	**Course Name:** Water Resource Engineering - II	**No. of Credits: 4**

Detailed Syllabus:

Diversion Head works: Types of Diversion head works-diversion and storage head works, weirs and barrages, layout of diversion head works, components. Causes and failure of hydraulic structures on permeable foundations, Bligh's creep theory, Khosla's theory, determination of uplift pressure, impervious floors using Bligh's and Khosla's theory, exit gradient, functions of U/s and d/s sheet piles.

Canal structures I: Types of falls and their location, design principles of Sarda type fall, trapezoidal notch fall and straight glacis fall.

Canal structures II: Canal regulation works, principles of design of distributory and head regulators, canal outlets, types of canal modules, proportionality, sensitivity and flexibility.

Cross Drainage works: types, selection of site, design principles of aqueduct, siphon aqueduct and super passage.

Dams: merits and demerits, factors affecting selection of type of dam, factors governing selecting site for dam, types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary

profile and practical profile of a gravity dam, limiting height of a low gravity dam, stability analysis, drainage galleries.

Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage.

Spillways: types of spillways, design principles of Ogee spillways, types of spillway gates.

REFERENCES:

1. Irrigation engineering and hydraulic structures by S.K Garg, Khanna publishers.
2. Irrigation engineering by K.R.Arora
3. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta

Course Code:	**Course Name:** Transportation engineering - I Lab	**No. of Credits: 2**

Detailed Syllabus:

ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Abrasion Test.
5. Shape tests
6. Soundness test

BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping value
6. Marshal stability
7. Viscosity test

Course Code:	**Course Name:** Soil mechanics Lab	**No. of Credits: 2**

Detailed Syllabus:

1. Grain size analysis
2. Proctor compaction test
3. California bearing ratio test
4. Specific gravity of soil particles
5. Sand replacement method
6. Atterberg limits
7. Shrinkage limit
8. Consolidation test
9. Direct shear test
10. Vane shear test

E3 Sem1 Courses and Syllabus

Course Code:	Course Name: Design of concrete structures - II	No. of Credits: 4

Detailed Syllabus:

Design of Retaining walls, cantilever and counter fort

Design of RCC water tanks, Circular and rectangular types.

Introduction to bunkers, silos and Chimney, concepts of loading and Design.

INTRODUCTION to PSC – General principles of prestressing pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their
characteristics. IS Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

LOSSES OF PRESTRESS: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses. Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

DESIGN OF SECTIONS FOR FLEXURE AND SHEAR: Allowable stress, Design criteria as per IS Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

ANALYSIS OF END BLOCKS: by Guyon's method and Mugnel method, Anchorage zone stresses – Approximate method of design – Anchorage zone reinforcement – Transfer of prestress pre-tensioned members.

DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS: Importance of control of deflections – factors influencing deflections – short term deflections of un cracked members prediction of long term deflections.

TEXT BOOKS:

1. Advanced Reinforced concrete structures by Vargheesh, Pranties Hall of India Pvt. Ltd.
2. Design drawing of concrete and steel structures by N.Krishna Raju University Press 2005.
3. Reinforced concrete structures Vol-2 by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications
Pvt. Ltd., New Delhi
4.Prestressed Concrete by Krishna Raju; - Tata McGraw Hill Publications.
5.Prestressed Concrete by N.Rajasekharan; - Narosa publications.

Course Code: CE3202	**Course Name:** Building science	**No. of Credits: 4**
Detailed Syllabus:		
Course Code: CE3201	**Course Name:** Environmental Engineering - 1	**No. of Credits: 4**
Detailed Syllabus:		
Course Code:	**Course Name:** Foundation Engineering	**No. of Credits: 4**

Detailed Syllabus:

SOIL EXPLORATION: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

EARTH SLOPE STABILITY: Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number, Stability of slopes of earth dams under different conditions.

EARTH PRESSURE THEORIES: Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method

SHALLOW FOUNDATIONS: Types - choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi, Meyerhof, Skempton and IS Methods, Safe bearing pressure based on N-value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures - Settlement Analysis

PILE FOUNDATION: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New Age International Pvt. Ltd, (2004).
2. Foundation Engineering by Varghese,P.C., Prentice Hall of India., New Delhi.
3. Soil Mechanics and Foundations by - by B.C.Punmia, Ashok Kumar Jain and Arun Kumar

Jain, Laxmi, publications Pvt.
Ltd., New Delhi

REFERENCES:

1. Das, B.M., - (1999) Principles of Foundation Engineering –6th edition (Indian edition) Thomson Engineering
2. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, New york.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
4. Geotechnical Engineering by S. K.Gulhati & Manoj Datta – Tata McGraw Hill Publishing company New Delhi. 2005.
5. Teng,W.C – Foundation Design , Prentice Hall, New Jersy

Course Code:	**Course Name:** Transportation Engineering - II	**No. of Credits: 4**

Detailed Syllabus:

Railway Engineering:
Introduction, historic development of Indian railways, traction
Railway alignment & surveys
Permanent way, Gauges
Rails-{functions, types, designation, defects}
Sleepers-{functions, types}
Ballast , formation & track drainage
Geometric design-{gradients, super elevation, transition curves, vertical curves}
Track fittings and fastenings
Railway signaling

Airport planning:
Introduction, Airport Layout and components
Functions & design aspects of APRON, TURN TABLE, HANGER
Aircraft characteristics
Airport site selection & obstructions
Runway design-{ orientation, length of runway & corrections}
Taxiway design & visual guidance

TEXT BOOKS:

1. Railway engineering by Satish Chandra
2. Railway engineering, Harbor , Airport and Dock engineering by Amit Gupta

Course Code: CE3801	**Course Name:** Environmental Engineering - 1 Lab	**No. of Credits: 2**

Detailed Syllabus:

E3 Sem2 Courses and Syllabus

Course Code:	Course Name: Environmental Science	No. of Credits: 4

Detailed Syllabus:

Course Code:	Course Name: Construction Planning and Scheduling	No. of Credits: 4

Detailed Syllabus:

Unit 1: Projects & Construction Projects

Unique features of construction, construction project, types and features, phases of a project, agencies involved and their methods of execution.

Unit 2: Construction project planning

Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, estimating durations, sequence of activities, activity utility data

Unit 3: Techniques of planning

Bar charts, Networks: basic terminology, types of precedence relationships: finish to start, start to start, finish to finish, start to finish, preparation of CPM networks: activity on link and activity on node representation, analysis of single relationship (finish to start) networks, computation of float values, critical and semi critical paths, calendaring networks.

Unit 4: Resource Scheduling

Bar chart, line of balance technique, resource constraints and conflicts, resource aggregation, allocation, smoothening and leveling.

Unit 5: PERT

Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

Unit 6: Planning and organizing construction site and resources

Site: site layout, developing site organization, record keeping at site, Manpower: planning, organizing, staffing, motivation, Materials: concepts of planning, procurement and inventory control, Equipment: basic concepts of planning and organizing, Funds: cash flow, sources of funds.

Unit 7: Construction costs

Classification of costs, time cost trade-off in construction projects, compression and decompression

Unit 8: Monitoring & control

Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures.
Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control. Safety and health on project sites: accidents; their causes and effects, costs of accidents, occupational health problems in construction, organizing for safety and health.

Text/Reference Books:

1. Barrie D.S. & Paulson B C, Professional Construction Management, McGraw Hill
2. Chitkara K K, Construction Project Management, Tata McGraw Hill
3. P K Joy, Handbook of Construction Management
4. King & Hudson, Construction Hazard and Safety Handbook, Butterworths
5. Antill J M & Woodhead R W, Critical Path Methods in Construction Practice, Wiley

Course Code:	**Course Name:** Environmental Engineering- II	**No. of Credits: 4**

Detailed Syllabus:

Course Code:	Course Name: Estimation and Costing	No. of Credits: 4

Detailed Syllabus: ***Module 1: Estimates***

Various types, their relative importance. factors to be considered, complete set of Estimate. Approximate estimates- importance, purpose, different methods. Use of CBRI Equations for the same. Methods of preparation of estimates for projects such as: Building R.C.C., Load bearing, Road, Culvert, Irrigation; Water supply and sewerage: miscellaneous works like Manhole, water storage tank, septic tanks; Trusses of steel, Industrial Shed.

Module 2: Measurements for various items

Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Earthwork Calculations

Module 3: Material survey

Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials.

Module 4: Specifications

Types, requirements and importance, detailed specifications for the buildings, roads, minor bridges and industrial structures.

Module 5: Rate analysis

Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment.

Module 6: Tender & Contracts

Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and items, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc.

Unit 7: Construction Law

Introduction to acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.

Unit 8: Estimation in computer

Use of computers in quantity surveying.

Term Work Assignments **to include:**

1. To find out the approximate estimate of a multistoried building by approximate method.
2. Detailed estimate of the following with the required material survey for the same.
    a. ground plus three storied building (RCC)
    b. bridge with minimum 2 spans
    c. factory building
    d. road work
    e. cross drainage work
    f. load bearing structure
3. Preparation of valuation report in standard Government form.
4. Assignments on rate analysis, specifications and simple estimates.
5. Detailed estimate of minor structure.
6. Bar bending schedule.

Text Books:

1. B.N. Dutta, Estimation and Costing
2. M Chakravarty, Estimating, Costing Specifications & Valuation
3. Joy P K, Handbook of Construction Management, Macmillan
4. B.S. Patil , Building & Engineering Contracts

Reference Books:

1. Relevant Indian Standard Specifications.
2. World Bank Approved Contract Documents.
3. FIDIC Contract Conditions.
4. Acts Related to Minimum Wages, Workman's Compensation, Contract, and Arbitration

Course Code:	**Course Name:** Design of Steel Structures	**No. of Credits: 4**

Detailed Syllabus:

Connections - welded, Bolted : Introduction, Advantages and disadvantages- Strength -Butt and fillet welds: Permissible stresses – IS Code requirements. Design of connections- moment acting in the plane and at right angles to the plane of the joints, beam to beam and beam to Column connections.

Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

Tension members and compression members: General Design of members subjected to direct tension and bending – effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc. Design of Built up compression members – Design of lacings and batten. Design Principles of Eccentrically loaded columns splicing of columns.

Design of Column Foundations: Design of sign of slab base and gusseted bases. Column bases

subjected moment.

Roof Trusses: Different types of trusses – Design loads – Load combinations IS Code recommendations, structural details – Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

Plate Girder: Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates stiffeners – splicings and connections.

Gantry girder: impact factors - longitudinal forces, Design of Gantry girders

TEXT BOOKS:

1. Design of steel structures by S.K. Duggal, Tata McGraw Hill, New Delhi
2. Comprehensive Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications,
New Delhi.
3. Structural design in steel by Sarwar Alam Raz, New Age International Publishers, New Delhi
4. Design of Steel Structures by P.Dayaratnam; S. Chand Publishers
5. Design of Steel Structures by M.Raghupathi, Tata Mc. Graw-Hill

Course Code:	**Course Name:** Civil Engineering Drawing Lab – 2	**No. of Credits: 2**
Detailed Syllabus:		

Course Code:	**Course Name:** Construction Planning and Scheduling Lab	**No. of Credits: 2**
Detailed Syllabus:		

E3 Summer Semester

Course Code: CH3301	**Course Name:** Summer internship	**No. of Credits: 6**

E4 Sem1 and Sem2 Courses are Electives and Projects

Course Code:CE4700	**Course Name:** Project – I	**No. of Credits: 8**

Course Code:	Course Name: Elective-I	No. of Credits: 4

Detailed Syllabus:

TRAFFIC ENGINEERING AND MANAGEMENT

Unit I

Introduction: Importance of traffic engineering, Fundamental parameters, relationships, Fundamental models

Unit II

Highway capacity: Definition of Capacity – Importance of capacity – Factors affecting Capacity- Concept of Level of Service- Different levels of Service- Concept of Service Volume- Peak Hour Factor.

Unit III

Traffic studies: Speed studies, volume studies, travel time and delay studies, origin and destination studies, parking studies, pedestrian studies, toll booth studies, fuel consumption and automobile pollution studies.

Unit IV

Traffic control devices: Traffic signs, traffic signals, Road markings, Intersection design, rotary design and grade separated intersection.

Unit V

Traffic safety: Types of accidents, Causes of road accidents, Remedial measures, Safety audit, principles of safety audit, intelligent transport system

REFERENCES:

1. Traffic engineering and transportation planning – LR Kadiyali – Khanna publishers.
2. Principles of Transportation Engineering – Partha Chakroborthy, Animesh Das – Prentice Hall of India.
3. Fundamentals of Transportation Engineering - C.S. Papa Costas, Prentice Hall (India).

Course Code:	Course Name: Elective-II	No. of Credits: 4

Detailed Syllabus:

URBAN TRANSPORTATION SYSTEM PLANNING

Introduction:

Transport and Socioeconomic Activities, Literature on Discrete Choice Modeling, Utility Theory, Model calibration and validation. Transportation in the Cities, Freight. Transportation, Future Developments.

Urban Transportation System Planning

- Conceptual Aspects: Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation, Sequence of Activities Involved in Transport analysis.

Trip Generation Analysis: Trip Production Analysis, Category Analysis, Trip Attraction Modelling.

Mode Choice Modelling:
Influencing Factors, Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode Choice, Binary Choice Situations, Multinomial Logit Model, Model calibration, Case studies.

Trip Distribution Analysis:
Presentation of Trip-Distribution Data, PA Matrix to OD Matrix, Basis of Trip Distribution, Gravity Model of Trip Distribution, Calibration of Gravity Model, Singly and Doubly Constrained Gravity Models, A case Studies, Growth Factor Methods of Trip Distribution, Uniform Factor Method, Average Factor Method, Fratar Growth-Factor Method, Disadvantage of Growth Factor Method.

Route Assignment:
Description of transport network, Route Choice Behavior, The Minimum Path, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity-Restrained Traffic Assignment

Transportation Surveys:
Definition of Study Area, Zoning, Types of Movements, Types of Surveys, Home Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-Interview Survey, Cordon-Line Survey, Post-Card Questionnaire Survey, Registration-Number Survey, Tag-on Vehicle Survey.

Urban Structure:
Urban Activity Systems, Urban Movement Hierarchies, Types of Urban Structure, Centripetal-Type Urban Structure, Grid Type Urban Structure, Linear-Type Urban Structure, Directional Grid Urban Structure.

REFERENCES:
1. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York.
2. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.
3. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.

Course Code:	**Course Name:** Elective-III	**No. of Credits: 4**

Detailed Syllabus:

GROUND IMPROVEMENT TECHNIQUES

UNIT – I

Dewatering: methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well pointsHorizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis .

UNIT –II

Grouting: Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage groutinghydraulic fracturing in soils and rocks- post grout test.

UNIT – III

In – situ densification methods in granular Soils:– Vibration at the ground surface, Impact at the Ground Surface, Vibration at
depth, Impact at depth.

UNIT - IV

In – situ densification methods in Cohesive soils:– preloading or dewatering, Vertical drains – Sand Drains, Sand wick
geodrains – Stone and lime columns – thermal methods.

UNIT – V

Stabilisation: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride,
sodium silicate and gypsum

UNIT – VI

Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design
principles of reinforced earth walls.

UNIT – VII

Geosynthetics : Geotextiles- Types, Functions and applications – geogrids and geomembranes – functions and
applications.

UNIT - VIII

Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure.
Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

TEXT BOOKS:

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Purushotham Raj. Ground Improvement Techniques, Laxmi Publications, New Delhi

REFERENCES:

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,

Course Code:	**Course Name:** Project-II	**No. of Credits: 8**

Course Code:	**Course Name:** Elective-IV	**No. of Credits: 4**
Detailed Syllabus:		
Course Code:	**Course Name:** Elective-V	**No. of Credits: 4**
Detailed Syllabus:		
Course Code:	**Course Name:** Elective-VI	**No. of Credits: 4**
Detailed Syllabus:		
List of Electives will be offered during E4Sem1 and Sem2		
Course Code:	**Elective1: Traffic Engineering and Management (TEM)**	**No. of Credits: 4**

Detailed Syllabus:

Unit I

Introduction: Importance of traffic engineering, Fundamental parameters, relationships, Fundamental models

Unit II

Highway capacity: Definition of Capacity – Importance of capacity – Factors affecting Capacity- Concept of Level of Service- Different levels of Service- Concept of Service Volume- Peak Hour Factor.

Unit III

Traffic studies: Speed studies, volume studies, travel time and delay studies, origin and destination studies, parking studies, pedestrian studies, toll booth studies, fuel consumption and automobile pollution studies.

Unit IV

Traffic control devices: Traffic signs, traffic signals, Road markings, Intersection design, rotary design and grade separated intersection.

Unit V

Traffic safety: Types of accidents, Causes of road accidents, Remedial measures, Safety audit, principles of safety audit, intelligent transport system

References:

1. Traffic engineering and transportation planning – LR Kadiyali – Khanna publishers.
2. Principles of Transportation Engineering – Partha Chakroborthy, Animesh Das – Prentice Hall of India.

3. Fundamentals of Transportation Engineering - C.S. Papa Costas, Prentice Hall (India).

Course Code:	Elective2: Urban Transportation System Planning(UTSP)	No. of Credits: 4

Detailed Syllabus:

Introduction:

Transport and Socioeconomic Activities, Literature on Discrete Choice Modeling, Utility Theory, Model calibration and validation. Transportation in the Cities, Freight. Transportation, Future Developments.

Urban Transportation System Planning

- Conceptual Aspects: Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation, Sequence of Activities Involved in Transport analysis.

Trip Generation Analysis: Trip Production Analysis, Category Analysis, Trip Attraction Modelling.

Mode Choice Modelling:

Influencing Factors, Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode Choice, Binary Choice Situations, Multinomial Logit Model, Model calibration, Case studies.

Trip Distribution Analysis:

Presentation of Trip-Distribution Data, PA Matrix to OD Matrix, Basis of Trip Distribution, Gravity Model of Trip Distribution, Calibration of Gravity Model, Singly and Doubly Constrained Gravity Models, A case Studies, Growth Factor Methods of Trip Distribution, Uniform Factor Method, Average Factor Method, Fratar Growth-Factor Method, Disadvantage of Growth Factor Method.

Route Assignment:

Description of transport network, Route Choice Behavior, The Minimum Path, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity-Restrained Traffic Assignment

Transportation Surveys:

Definition of Study Area, Zoning, Types of Movements, Types of Surveys, Home Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-Interview Survey, Cordon-Line Survey, Post-Card Questionnaire Survey, Registration-Number Survey, Tag-on Vehicle Survey.

Transport Related Land-Use Models:

Development of Land - Use models, The Lowry Model, Application of Lowry Model.

Urban Structure:

Urban Activity Systems, Urban Movement Hierarchies, Types of Urban Structure,

Centripetal-Type Urban Structure, Grid Type Urban Structure, Linear-Type Urban Structure, Directional Grid Urban Structure.

Urban Goods Movement:
Classification of Urban Goods Movements, Methodology of Approach to Analysis of Goods Movement, Modeling Demand for Urban Goods Transport.

REFERENCES:
1. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, NewYork.
2. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.
3. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.

Course Code:	**Elective3:** GROUND IMPROVEMENT TECHNIQUES (GIT)	**No. of Credits: 4**

Detailed Syllabus:

GROUND IMPROVEMENT TECHNIQUES

UNIT – I

Dewatering: methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points Horizontal wells-foundation drains-blanket drains- criteria for selection of fill material around drains –Electro-osmosis .

UNIT –II

Grouting: Objectives of grouting- grouts and their properties- grouting methods- ascending, descending and stage grouting hydraulic fracturing in soils and rocks- post grout test.

UNIT – III

In – situ densification methods in granular Soils:– Vibration at the ground surface, Impact at the Ground Surface, Vibration at
depth, Impact at depth.

UNIT - IV

In – situ densification methods in Cohesive soils:– preloading or dewatering, Vertical drains – Sand Drains, Sand wick
geodrains – Stone and lime columns – thermal methods.

UNIT – V

Stabilisation: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride,
sodium silicate and gypsum

UNIT – VI

Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design
principles of reinforced earth walls.

UNIT – VII

Geosynthetics : Geotextiles- Types, Functions and applications – geogrids and geomembranes –

functions and
applications.

UNIT - VIII

Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure.

Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

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