

SECOND YEAR THIRD SEMESTER

SL. NO.	COURSE NO.	SUBJECT	HOURS/WEEK			MARKS				CREDIT
			L	T	P	THEORY	SESS.	PRACT.	TOTAL	
*1.	MA 231	ENGINEERING MATHEMATICS –III	3	1	0	70	30	-	100	3.5
*2.	HU 231	ECONOMICS FOR ENGINEERS	2	0	0	35	15	-	50	2.0
*3.	ME 231	ENGINEERING MECHANICS	3	1	0	70	30	-	100	3.5
*4.	CS 231	PROGRAMMING AND DATA STRUCTURES	3	0	0	70	30	-	100	3.0
5.	CE 231	SOLID MECHANICS	3	1	0	70	30	-	100	3.5
6.	CE 232	BUILDING MATERIALS	3	0	0	70	30	-	100	3.0
		SUB-TOTAL							550	18.5
		PRACTICAL/DESIGN								
7.	ME231P	ENGINEERING GRAPHICS	1	0	3	-	30	70	100	2.5
8.	CS231P	PROGRAMMING AND DATA STRUCTURES LAB	0	0	3	-	30	70	100	1.5
9.	CE 232P	BUILDING MATERIAL LAB	0	0	3	-	15	35	50	1.5
		SUB-TOTAL							250	5.5
		TOTAL	18	3	9				800	24.0
10.	NC 231	TECHNICAL ENGLISH	2	0	1	-	35**	15**	-	0.0
11.	NC 232	PHYSICAL TRAINING-II	0	0	3	-	-	50**	-	0.0

***MA 231 ENGINEERING MATHEMATICS-III**
L T P C
3 1 0 3.5 Full Marks: 100 (70 + 30)

Fourier Series:

Dirichlet's condition-General Fourier series- odd and even functions, Half range-sine and cosine series-complex form of Fourier series, Practical Harmonic analysis.

Fourier Transforms:

Statement of Fourier integral theorem, Fourier transforms pairs, Fourier sine and cosine transforms, properties, transform of simple functions, convolution theorems, Parseval's identity.

Boundary Value Problems:

Classification of second order quasi linear partial differential equations-solution of one dimensional wave equation, one dimensional heat equation-steady state solution of two dimensional heat equation(insulated edges exclude)-Solution by separation of variables.

Solution in Series:

Series solution of second order differential equations, Bessel's and Legendre's equations- their series solutions, elementary of properties of Bessel functions and Legendre polynomials-recurrence relations-generating functions, orthogonality conditions

Complex Variables:

Analytic functions-properties, Cauchy-Rieman equations, construction of analytic function, determination of conjugate harmonic, application to two dimensional potential problems; Conformal transformations- $w = z + a$, $w = az$, $w = 1/z$ and Bilinear Transformation. Cauchy's Integral theorem and Cauchy's integral formula (statement only), Taylor's and Laurent's expansions, isolated singularities, residues-Cauchy's residues theorem (statement only), contour integration-over unit circle and semi-circle(excluding poles on real axis).

Suggested Text Books & References:

1. R.V. Churchill, "Fourier Series and Boundary Value Problems", McGraw Hill,
2. I.N. Sneddon, "Fourier Transforms" McGraw Hill,
3. Churchill, Brown and Verhy, "Complex Variables and Applications", McGraw Hill,
4. B. S. Grewal, Higher Engineering Mathematics, Khanna Plublication, 41st Edition, New Delhi.

*HU 231	ECONOMICS FOR ENGINEERS		
L	T	P	C
2	0	0	2
Full Marks: 50 (35 + 15)			

Economics:

Meaning, Definition, Scope: Micro and Macro, Assumptions and Methods. Usefulness

Market demand and cost concepts:

Economic reasoning, Circular Flow in an economy, Law of supply and demand, Economic efficiency, Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Private and Social cost, Opportunity cost, Functions of Money and commercial Banking.

Inflation and deflation:

Concepts and regulatory measures, Economic Policy Reforms in India since 1991: Industrial policy, Foreign Trade policy, Monetary and fiscal policy, Impact on industry.

Accounting:

Book keeping single and double entry system, Journal and ledger, Preparation of Trial Balance, Trading account, Profit and loss account, Balance sheet(with simple adjustments).

Suggested Text Books & References:

1. Modern Economic Theory, K.K. Dewett.
2. Introduction to Accountancy, T.S. Grewal.
3. Panneer Selvam, R, Engineering economics, Prentice Hall of India, New Delhi.
4. Wheeler R (Ed) Engineering economic analysis, Oxford University Press.
5. A Text Book of Economic Theory, Stonier and Hauge.
6. Engineering Economics, Degramo.
7. International Economics, Bo Sodersten
8. Principles of Macroeconomics, Rangarajan and Dholakia.
9. Monetary Economics, Suraj B. Gupta
10. Cost Accounting, Jawahar Lal
11. Project Planning Analysis, Selection Implementation and Review, Prasanna Chandra

ME 231		ENGINEERING MECHANICS		
L	T	P	C	
3	1	0	3.5	Full Marks: 100 (70 + 30)

System of Forces:

Introduction to mechanics, laws of mechanics, concept of a force, system of forces, resultant and equilibrium of system of coplanar concurrent forces , resultant and equilibrium of system of coplanar non- concurrent forces.

Friction:

Frictional force, types of friction, laws of friction, coefficient of friction, angle of friction, angle of repose, cone friction, impending motion of connected bodies, wedge, screw jack and rope friction.

Centroid & Area Moment of Inertia:

Centroid, Centre of gravity, Centroid of simple figures and composite sections. Area moment of inertia, polar moment of inertia, radius of gyration, theorems of moment of inertia, moment of inertia of standard figures and moment of inertia of composite sections.

Centre of Gravity & Mass Moment of Inertia:

Centre of gravity from first principles, centre of gravity of composite bodies and theorem of Pappus- Guldinus. Definitions, Mass moment of inertia from

first principles, transfer formula and mass moment of inertia of composite bodies.

Kinematics:

Introduction to Dynamics, Linear motion- motion with uniform velocity and uniform acceleration, Acceleration due to gravity, motion with varying acceleration. Curvilinear motion- motion of body associated with horizontal projection and inclined projection.

Kinetics:

Introduction, laws of motion, rectilinear motion of a particle, D'Alembert's Principle, Work- Energy Principle- work energy equation for translation, motion of connected bodies.

Suggested Text Books & References:

1. Engineering Mechanics, S. S. Bhavikattis, New Age International Pvt. Ltd.
2. Engineering Mechanics, K.L. Kumar, Harper & Row Publishers, New Delhi.
3. Engineering Mechanics, R. K. Rajput, Dhanpat Rai Publications, New Delhi.
4. Engineering Mechanics, A. Nelson, Tata McGraw Hill Education Pvt. Ltd.
5. Engineering Mechanics, R. K. Bansal and Sanjay Bansal.
6. Engineering Mechanics, Ferdin and L. Singer
7. Engineering Mechanics, A.K. Tayal
8. Engineering Mechanics, Irving H. Shames, Printice Hall of India Pvt. Ltd.
9. Engineering Mechanics-S. Timoshenko, D.H. Young & J. V. Rao-Tata McGraw Hill

***CS 231 PROGRAMMING AND DATA STRUCTURES**

L	T	P	C	
3	0	0	3	Full Marks: 100 (70 + 30)

Introduction to Algorithms :

Algorithm Development, Complexity analysis, Asymptotic Notations-Big-O, big-Theta, Big-Omega, little-o etc- Recursion and examples

Linear Data Structures :

Stacks-Operations and Applications, Queues-Operations and Applications, Circular Queues-Operations and Applications, Links Lists-Operation – Creations, insertion, Deletion, Circular Lists, Doubly Linked List, stacks, queues-implementations and applications- Sorting- Bubble sort- Insertion sort-Gnome sort-Selection sort-Stooge sort-Merge sort-Heapsort-Quicksort-Radix sort

TREE STRUCTURES :

Tree – tree traversals – Binary Tree – expression trees – applications of trees – binary search tree – AVL trees – binary heaps

HASHING AND SETS :

Hashing – hashing functions- Separate chaining – open addressing – rehashing – extendible hashing – Sets-Representation -Operations -Union and Find.

GRAPHS :

Definitions – Representations- breadth-first traversal – shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – applications of graphs

Suggested Text Books & References:

1. Seymour Lipschutz, Data Structures (Schaum Series.) McGraw Hill.
2. Seymour Lipschutz, Data Structures With C (Schaum Series) 1st Edition, 2010 McGraw Hill Education (India) Private Limited.
3. Horowitz, Sahni, Anderson-Freed, Fundamentals of Data Structures In C, 2nd Edition, 2008, Orient Longman.

CE 231**SOLID MECHANICS****L T****P C****3 1****0 3.5****Full Marks: 100 (70 + 30)****Simple Stress and Strains:**

Elastic Limits, Hookes law, Young's modules, Tension Test on mild steel, Ultimate strength, working stress, Factor of safety, direct stress in tapering bars, Compound bars, temperature stresses, shear stress, shear strain, Modulus of rigidity, Bulk modulus, Elastic constants and their relationships.

Simple Bending Moment and Shear Force Diagram:

Types of supports, determinate beams, Shear Force and bending moment diagrams of determinate beams.

Complex Stresses and Strain Energy:

Complex stress system, state of pure shear, general two dimensional stress systems, principal planes and principal stresses, maximum shear stress, Mohr's stress circle, Poisson's ratio, Principal strains in two and three dimensions strain energy, theories of failure.

Analysis of Pinjointed Frames :

Determination of forces in the members of trusses

Shear Stress Distribution :

Beams of rectangular, I and T sections.

Bending Stresses :

Theory of simple bending, distribution of bending stresses, composite beams.

Torsion :

Torsion, shear stress in solid and hollow circular shafts, angle of twist, power transmitted by a shaft.

Columns and Struss :

Euler's theory of long columns, short columns, slenderness ratio, crushing load, buckling load, various end conditions, equivalent length, Rankin's method, short columns subjected to eccentric loading.

Suggested Text Books & References:

1. Singh and Jha - Mechanics of Solids.
2. Popov - Mechanics of Solids.
3. Timoshenko and Gere - Mechanics of Solids.
4. Punmia B.C. - Strength of Materials.
5. Junarkar J.B. - Strength of Materials, Vol – I.

CE 232

BUILDING MATERIALS

L T

P C

3 0

0 3

Full Marks: 100 (70 + 30)

Introduction :

Introduction to structures of solids, ductility, brittleness, strength, stiffness, durability, hardness, toughness; Weakness of materials

Stones :

Classification, general characteristics, identification, selections criteria and uses of common building stones, quarrying of stones. Seasoning and dressing of stones. Testing of stones.

Clay Products :

Bricks, tiles, Terra Cotta etc., their composition, characteristics, manufacture and testing.

Cements :

Hydraulic cement, Portland Cement and its manufacture and types, chemistry of setting and hardening. Gels and Pastes. Admixtures and their chemical behavior, phase equilibrium diagram for portland cement, IS tests and specifications. Fresh Concrete: Batching, Mixing, workability, effect of admixture, Hardened Concrete: mechanical properties of hardened concrete, Water cement ratio, Porosity, Curing of concrete, High performance concrete, Design of concrete mix: IS code recommendation, British code and ACI code.

Lime Gypsum :

Occurrence, Properties, types, manufacture, I.S. tests and specifications Uses of Gypsum.

Mortar and Plaster :

Constituent, types, preparation, tests and uses. Types of pointing, Wall and Ceiling plaster.

Timber :

Definitions of related terms, classifications, characteristics, tests, uses, seasoning Preservation, fire proofing, ply-woods, Fiber boards and their manufacture and uses.

Plastics :

Classifications, properties, fabrication and uses in building industries.

Metals :

Properties and use of various kind of steel and aluminum alloys in building industries.

Miscellaneous Materials :

Characteristic, types, uses and limitation of glass, rubber, Asbestos.G.I., Plaster of Paris, bituminous felts and coirs and their products, Prestressed and Precast Concretes.

Suggested Text Books & References:

1. Arora, S.P. & Bindra, S.P., "A Text Book of Building Construction", Dhanpat Rai & Sons, Delhi
2. Jha, J & Sinha, S.K., "A Text Book of Engineering Building Construction", Khanna Publishers, Delhi
3. Kulkarni, C.J. Materials", Ahmedabad Book Depot, Ahmedabad, 1968
4. Kulkarni, C.J., "A Text Book of Engineering Construction", Ahmedabad Book Depot, Ahmedabad

5. Kumar Sushil, "Engineering Materials", Standard Publishers Distributors, Delhi
6. Kumar Sushil, "Building Construction", Standard Publishers Distributors, Delhi
7. McKay W.B, "Building Construction", Vol. I to IV, Orient Longman Ltd., Hyderabad, Bombay, Madras, Delhi, Vol. 1 & 2 –1995, Vol. 3 – 1996, Vol. 4
8. Punima, B.C., "A Text Book of Building Construction", Laxmi Publications, Delhi, Madras
9. Singh Surendra, "Engineering Materials", Konark Publishers Pvt. Ltd.
10. Rangawala S.C. "Engineering Materials"
11. Sushil Kumar, "Engineering Materials"
12. S.C. Rangwala, "Engineering Materials"

PRACTICAL / DESIGN

***ME 231P ENGINEERING GRAPHICS**

L	T	P	C	
1	0	3	2.5	Full Marks: 100 (70 + 30)

Fundamentals, Engineering Curves and Scale:

- A) Fundamentals of Engineering Graphics: Introduction to Drawing instruments and their uses. Layout of drawing sheets, different types of lines used in drawing practice, dimensioning system as per BIS.
- B) Engineering curves: Construction of regular polygons (up to hexagon). Construction of ellipse, parabola and hyperbola.
- C) Scales: Scale and representative fraction, construction and reading of plain and diagonal scales.

Projections of lines & Planes:

Introduction to first angle and third angle methods of projection.

- A) Projections of straight lines: perpendicular to one plane and parallel to the other, parallel to both the planes, parallel to one plane and inclined to the other, inclined to both the planes.
- B) Projections of planes: perpendicular to one plane and parallel to the other, perpendicular to both the planes, one plane and inclined to the other, inclined to both the planes.

Orthographic Projections of solids:

Projections of Prisms, Pyramids, Cylinder and Cones in simple position, axis perpendicular to one plane and parallel to the other, axis parallel to both planes, parallel to the to one plane & inclined to one plane (Excluding frustum and sphere).

Sections of solids & Development of surfaces:

- A) Sections of solids: Prisms, Pyramids, Cylinders and Cones (Simple positions and inclined to one plane and parallel to other).

- B) Development of plane and curved surfaces: Prisms, Pyramids, Cylinders and Cones along with cutting planes.

Isometric projections:

Isometric projections: Introduction to isometric, Isometric scale, Isometric projections and Isometric views of planes and solids – prisms, cones, pyramids and spheres.

Note: The above syllabus is to be covered in first angle method of projection.

Suggested Text Books & References:

1. Engineering Drawing and Graphics by K. Venugopal, New Age Publication
2. Engineering Drawing by N. D. Bhatt, Charotar Publication House, Mumbai
3. Fundamentals of Engineering by W. J. Luzadder, Drawing, Prentice Hall of India
4. Graphic Science by French and Vierck, McGraw Hill International
5. A text book of Engineering Drawing by R. K. Dhawan, S. Chand and Co.
6. Engineering Drawing by N. B. Shaha and B. C. Rana, Pearson Education
7. Engineering Drawing and Graphics Using AutoCAD by T. Jeyapooan, Vikas Publication
8. Engineering Drawing by K.L. Narayana, P. Kannaya & K. Venkata Reddy

*CS 231P PROGRAMMING AND DATA STRUCTURES LAB.

L	T	P	C	
0	0	3	1.5	Full Marks: 100 (70 + 30)

Based on CS231 Programming and Data Structure.

CE 232	P	BUILDING MATERIALS LAB
L	T	P
0	0	3
		1.5
		Full Marks: 100 (70 + 30)

List of Experiments:

1. Compressive strength of cement (using 1 : 3 mortar)
2. Tensile strength of cement (using 1 : 3 mortar)
3. Standard consistency test for cement.
4. Test for setting time (Initial and Final Setting time) for cement.
5. Moisture content and Bulking test for sand (Coarse/Fine).
6. Sieve Analysis test for a sample of coarse aggregate and to determine the fineness modulus for the aggregate sample.
7. Determination of compressive strength for concrete (1 : 2 : 4)
8. Determination of tensile test for concrete (1 : 2 : 4).
9. Slump factor test for concrete.
10. Compacting factor test for concrete.
11. Impact of water cement ratio on the strength of concrete.
12. Concrete Mix design.

NC 231 TECHNICAL ENGLISH

L T

P C

2 0

1 0

Full Marks: 50 (35 + 15 – Non Credit)

Style and organization in technical communication:

Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report.

Oral Presentation and professional speaking:

Basics of English pronunciation; Elements of effective presentation; Body Language and use of voice during presentation; Connecting with the audience during presentation; Projecting a positive image while speaking; Planning and preparing a model presentation; Organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech.

Career Oriental Communication:

Covering, Resume and bio-data: Design & style; Applying for a job: Language and format of job application. Job Interviews: purpose and process; How to prepare for interviews; Language and style to be used in interview; Types of interview questions and how to answer them; Group Discussion: structure and dynamics; Techniques of effective participation in group discussion; Preparing for group discussion.

Language Practice:

Emphasizing Listening and comprehension skills; Reading Skills; Sound Structure of English and intonation patterns; training in speaking skills covering oral presentations.

Suggested Text Books & References:

1. Fred Luthans, Organizational Behaviour, McGraw Hill
2. Lesikar and petit, Report writing for Business
3. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
4. Wallace and masters, Personal Development for Life and Work, Thomson Learning
5. Hartman Lemay, Presentation Success, Thomson Learning
6. Malcolm Goodale, Professional Presentations
7. Farhathullah, T. M. Communication skills for Technical Students
8. Michael Muckian, John Woods, The Business letters Handbook
9. Herta A. Murphy, Effective Business Communication

SECOND YEAR FOURTH SEMESTER

SL. NO.	COURSE NO.	SUBJECT	HOURS/WEEK			MARKS				CREDIT
			L	T	P	THEORY	SESS.	PRACT.	TOTAL	
1.	MA 241	ENGINEERING MATHEMATICS - IV	3	1	0	70	30	-	100	3.5
2.	CE 241	STRUCTURAL ANALYSIS - I	3	1	0	70	30	-	100	3.5
3.	CE 242	ENGINEERING GEOLOGY	3	0	0	70	30	-	100	3.0
4.	CE 243	SURVEYING	3	1	0	70	30	-	100	3.5
5.	CE 244	FLUID MECHANICS	3	0	0	70	30	-	100	3.0
		SUB-TOTAL							500	16.5
		PRACTICAL/DESIGN								
6.	CE 242P	ENGINEERING GEOLOGY LAB	0	0	3	-	30	70	100	1.5
7.	CE 243P	SURVEYING PRACTICAL	0	0	6	-	30	70	100	3.0
8.	CE 244P	FLUID MECHANICS LAB	0	0	3	-	30	70	100	1.5
		SUB-TOTAL							300	6.0
		TOTAL	15	3	12				800	22.5
9.	NC 241	SOFT SKILL- I	3	0	0	-	50**	-	-	0.0
10.	NC 242	PHYSICAL TRAINING	0	0	3	-	-	50**	-	0.0

MA 241 ENGINEERING MATHEMATICS – IV
L T P C
3 1 0 3.5 Full Marks: 100 (70 + 30)

Solution of Algebraic and Transcendental Equations:

Bisection, Regula-Falsi, Newton-Raphson and Iterative method. Gaussian elimination method, Gauss-Jordan method, Factorization method, Gauss-Jacobi and Gauss-Seidel methods.

Statistics Analysis:

Random variables, Discrete and continuous probability distributions, Binomial distribution, Poisson distribution, Normal distribution, Chi-square test, Student t-test. Method of least squares, fitting of other curves, method of group averages, method of moments.

Numerical Differentiation and Integration:

Newton's-Gregory forward and backward interpolations formulae, Lagrange's and Newton's divided difference interpolation formulae (without proof). Inverse interpolation using Lagrange's interpolation formula. Numerical differentiation using Newton's forward and backward interpolation formulae. Numerical integration- trapezoidal rule, Simpson's rules-one third and three-eighth, Weddle's rule (no derivation of any formula).

Solution of Partial Differential Equations

Classification of second order equations, Finite difference method – Elliptic equation, Solution of Laplace’s equation, solution of Poisson’s equation, Parabolic equation, solution of heat equation, Hyperbolic equation, solutions of wave equations (Elementary treatment)

Eigen Value problems:

Power method-Largest and smallest Eigen values, and corresponding Eigen vectors, Household method, Jacobi’s method

Suggested Text Books & References:

1. Shartry S.S., “Numerical Methods”, Prentice Hall Inc., India.
2. Noble Ben, “Numerical Methods”, New York International Publications, New York.
3. Stanton Ralph G., “Numerical Methods for Engineering”, Englewood Cliffs, N.J., Prentice Hall Inc.
4. Buckingham R.A. “Numerical Methods”, Sir Isaac Pitman Sons. Ltd. London.
5. Bakhvalov N.S., “Numerical Methods”, Mir. Pub., Moscow.
6. Grewal B.S., “Numerical Methods”, Khanna Pub., New Delhi.

CE 241		STRUCTURAL ANALYSIS-I		
L	T	P	C	
3	1	0	3.5	Full Marks: 100 (70 + 30)

Unit-1:

Combined bending and direct stress, eccentric loading, middle third rule for rectangular sections, middle quarter rule for circular sections, Kern of a section, stability of retaining walls, unsymmetrical bending of beams.

Unit-2:

Shear stress distribution in beams of rectangular circular, I & T sections, Shear centre and its location in thin walled flanged sections, combined bending and torsions.

Unit-3:

Relations between load, shear force, bending moment, slope and deflection; slopes and deflections in determinate beams using double integration method, moment are method and the conjugate beam method.

Unit-4:

Strain energy in members due to Axial load, shear force, bending moment and twisting moment, Castigliano’s first theorem, Deflection of beam by

Castigliano's theorem, minimum strain energy and Castigliano's Second Theorem.

Unit-5:

Deflection of joints in determinate frames by using unit load method, Joint deflection if linear deformation of all the members are known, Maxwell's Reciprocal theorem applied to frames. Deflection of joints in determinate frames by Castigliano's First theorem.

Unit-6:

Three hinged arch, determination of horizontal thrust, bending moment, radial shear and normal thrust, supports at different levels.

Unit-7:

Degree of Static indeterminacy, propped cantilevers, fixed beams, continuous beams, two hinged arch, trussed beams, Analysis of indeterminate beams by three moment theorem and least work or the minimum strain energy method.

Suggested Text Books & References:

1. Punmia B.C. "Strength of Materials" Vol – I & II
2. Junarkar J.B., "strength of Materials" Vol – I & II
3. Jain O.P. & Arya A.S., "Theory of Structures", Vol. – I & II, Nem Chand Bros, Roorkee
4. Kinney, J.S., "Indeterminate Structural Analysis", McGraw Hill Book Company,
5. Prakash Rao, D.S., "Structural Analysis", Universal Press (India) Limited, Hyderabad
6. Wang, C.K., "Indeterminate Structural Analysis", McGraw Hill Book Company

CE 242 ENGINEERING GEOLOGY

L	T
3	0

P	C
0	3

Full Marks: 100 (70 + 30)

General Geology:

Introduction to Geology, Scope of Engineering Geology in Civil Engg. Practices. Elementary concept about earth's internal structures. Weathering and types of weathering, Earthquakes-distribution, Focus, Epicenter, Causes, Magnitude and Intensity, zonation of earthquakes in India.

Mineralogy:

Introduction, physical properties of minerals, Physical properties of common rock forming minerals – quartz, Feldspar, muscovite, biotite, hornblende, tourmaline, augite and their applications in Civil Engg.

Petrology:

Introduction Igneou Petrology: Formation and classification of Igneous rocks.
Sedimentary Petrology: Formation and classification of Sedimentary rocks.
Metamorphic Petrology: Formation and classification of Metamorphic rocks.

Historical Geology:

Elementary principles of statigraphy, Standard stratigraphic scale and details of Aravalli, Delhi and Vinchyan System. Occurrence of building and construction materials in India.

Structural Geology:

Introduction to Structural Geology, Out Crop, Dip and Strike, apparent and true dip. Description of Fold, Faults, Joints. Recognition of Fold, Fault and Unconformity in the field. Volcanoes. Classification of Folds, Faults, Joints and Unconformity, Clinometer compass.

Engineering Geology:

Geological investigations and their influence on the selection, location and type of dams, reservoir, tunnels and piers, precaution and treatment against faulting, folding, bedding, joints, porosity and permeability and ground water conditions, Land slides and hill slopes. Construction of roads in hilly area and precaution and treatment against various structures. Engineering properties' of rocks and soils.

Suggested Text Books & References:

1. A Text Book of Geology By P.K. Mukherjee
2. Engineering Geology By C.C. Matheuson.
3. Engineering Geology By Dr. D.S. Arora.
4. Engineering and General Geology by Parbin Singh

CE 243		SURVEYING		
L	T	P	C	
3	1	0	3.5	Full Marks: 100 (70 + 30)

Introduction:

Concept of surveying, classifications, principles of surveying, measurement of distances, Instruments for measuring distances, Ranging out surveying lines, chaining on sloping ground, Errors in Chaining and tape correction, Chain surveying, compass surveying.

Leveling:

Definition of terms, types of level and leveling staff, Temporary and permanent adjustments of levels, Principles of leveling, Booking staff readings and reduction of levels, Classification of leveling – Profile leveling, Cross-section

Reciprocal leveling and trigonometric leveling. Errors in leveling, sensitiveness of the bubble tube, Contouring. Plane table Surveying.

Theodolite traversing:

Types of theodolites and their adjustment, Measurement of horizontal and vertical angles, lining-in, prolonging a straight line, checks on closed traverse, The traverse computations. Balancing the traverse, computation of area and volume.

Tacheometric surveying:

Principle of stadia method, instrument constant, Anallatic lens, Distance and elevation of stations, subtense method, tangential method, Errors, Subtense bar and its use.

Triangulation:

Classification, figures, signals and towers, Intervisibility and height of stations. Satellite station, Base line measurement, corrections to the measured length. Trigonometrical levelling.

Trilateration:

Definition and principles. General requirements and procedure. E.D.M. instruments, project survey, route surveys. Survey for canals, highways, railways, and transmission lines. Setting out buildings, culverts, bridges, Tunnel, Hydrographic surveying.

Suggested Text Books & References:

1. Agor, R, "Surveying", Vol. I & II, Khanna Publications, Delhi
2. Arora, K.R., "Surveying", Vol. I & II, Standard Book House, Delhi
3. Bannister, A and Baker, R., "Solving Problems in Surveying", Longman Scientific Technical, U.K.
4. Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd., London
5. Punmia, B.C., "Surveying", Vol. I & II, Laxmi Publications, New Delhi

CE 244 Fluid Mechanics

L T P C

3 0 0 3 Full Marks: 100 (70 + 30)

Fluid properties; Pressure measurement; Hydrostatic forces on plane and curved surfaces; Buoyancy and equilibrium; Stability, metacentric height; Types of flow; Continuity; Energy and momentum equations; Velocity distribution and velocity coefficients, practical applications; Navier Stoke equation; Shear stress and pressure gradient; Flow through pipes, Hagen-Poiseuille equation; Turbulence, Prandtl's mixing length, eddy viscosity; Darcy-Weisbach equation

for flow through pipes, friction factor, Moody diagram, minor losses, pipes in series and B.Tech. Programme in Civil Engineering, parallel, equivalent length, pipe network analysis; Water hammer; Boundary layer concept, drag coefficients, control of boundary layer; Dimensional analysis and similitude.

Suggested Text Books & References:

1. V.L. Streeter and E.B. Wylie, Fluid Mechanics, McGraw Hill
2. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics, Standard Book House
3. B.F. White, Fluid Mechanics, McGraw Hill
4. K S. Massey, Mechanics of Fluids, Van Nostrand Reinhold Co.
5. J. Frabzini, Fluid Mechanics with Engineering Applications, McGraw Hill
6. J.H. Spurk, Fluid Mechanics – Problems and Solutions, Springer

PRACTICAL / DESIGN**CE 242P ENGINEERING GEOLOGY LAB.**

L	T	P	C	
0	0	3	1.5	Full Marks: 100 (30 + 70)

List of Experiments:

1. Identification of Rock forming minerals.
2. Identification of Rocks.
3. Analysis of Geological maps.
4. Optical Properties of Minerals
5. Geological Field Tour

Suggested Text Books & References:

1. A Text Book of Geology By P.K. Mukherjee
2. Geological Field Manual By C.C. Matheuson

CE 243P SURVEYING PRACTICAL

L	T	P	C	
0	0	6	3	Full Marks: 100 (30 + 70)

List of Practicals :

1. To find the distance between two points by means of chaining under the following conditions-
 - (a) when there is obstacle to chaining but not ranging.
 - (b) When there is obstacle to both chaining and ranging.
2. Study of different Levels and Leveling Staff Practice for temporary adjustment. To find out the reduced levels of given points using Dumpy Level (Reduction by Height of Collimation method).
3. Study of a Tilting (I.O.P.) Level and to find out the reduced levels of given points (Reduction of data by Rise and Fall method)
4. To establish a Bench Mark by Check Leveling with I.O.P. level and closing the work at the starting Bench Mark.
5. To perform Fly Leveling with a I.O.P. level.
6. To draw the longitudinal and cross-sections profiles along a given route.
7. Practice for Temporary adjustments of a Vernier Theodolite and taking Horizontal and Vertical angular measurements, by Reiteration method.

8. (i) Measurement of a horizontal angles by Repetition method at three zeros and four repetitions.
(ii) Determination of elevation and horizontal distance of a given point using Substance Bar and a Vernier Theodolite.
9. (i) Determination of the Tacheometric constants of a given Theodolite.
(ii) To determine the gradient between two given points using Tacheometric method.
10. To determine the bearing of a given traverse using Prismatic Compass and plotting of the traverse.
11. Establishment of a given traverse using Tacheometric method.

CE 244P FLUID MECHANICS LAB
L T P C
0 0 3 1.5 Full Marks: 100 (30 + 70)

List of Experiments:

1. Measurement of fluid pressure using various manometers and gauges.
2. Experimental study on capillarity.
3. Determination of coefficient of viscosity of a fluid using viscometer.
4. Experimental study on stability of floating bodies.
5. Study of different types of flow using Reynold's apparatus.
6. Determination of friction factor in pipes using pipe friction apparatus.
7. Experimental study on flow nets using Hele-Shaw apparatus.
8. Study of flow behavior in open channels using tilting flume.

Suggested Text Books & References:

1. Asawa G.L. "Experimental Fluid Mechanics", Vol. I, Nem Chand & Bros, Roorkee

NC 241 SOFT SKILL - I
L T P C
3 0 0 0 Full Marks: 50 (Sessional-Non Credit)

SELF ANALYSIS

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem

ATTITUDE

Factors influencing Attitude, Challenges and lessons from Attitude.

Change Management

Exploring Challenges, Risking Comfort Zone, Managing Change

MOTIVATION

Factors of motivation, self-talk, Intrinsic & Extrinsic Motivators.

GOAL SETTING

Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

TIME MANAGEMENT

Value of time, Diagnosing Time Management, Weekly Planner, to do list, Prioritizing work.

CREATIVITY

Out of box thinking, Lateral Thinking

Suggested Text Books & References:

1. INSIGHT, Career Development Centre, SRM Publications
2. Covey Sean, Seven Habits of Highly Effective Teens , New York, Fireside Publishers
3. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster
4. Thomas A Harris, I am ok, You are ok, New York - Harper and Row.
5. Daniel Coleman, Emotional Intelligence, Bantam Book.

THIRD YEAR FIFTH SEMESTER

SL. NO.	COURSE NO.	SUBJECT	HOURS/WEEK			MARKS				CREDIT
			L	T	P	THEORY	SESS.	PRACT.	TOTAL	
1.	CE 351	STRUCTURAL ANALYSIS -II	3	1	0	70	30	-	100	3.5
2.	CE 352	GEOTECHNICAL ENGINEERING – I	3	0	0	70	30	-	100	3.0
3.	CE 353	DESIGN OF CONCRETE STRUCTURES	3	1	0	70	30	-	100	3.5
4.	CE 354	ENVIRONMENTAL ENGINEERING – I	3	0	0	70	30	-	100	3.0
5.	CE 355	HYDRAULICS & HYDRAULIC MACHINERY	3	1	0	70	30	-	100	3.5
6.	CE 356	BUILDING PLANNING & DRAWING	3	0	0	70	30	-	100	3.0
		SUB-TOTAL							600	19.5
		PRACTICAL/DESIGN								
7.	CE 352P	GEOTECHNICAL ENGINEERING LAB- I	0	0	3	-	25	50	75	1.5
8.	CE 355P	HYDRAULICS & HYDRAULIC MACHINERY LAB	0	0	3	-	25	50	75	1.5
9.	CE 356P	BUILDING PLANNING & DRAWING LAB	0	0	3	-	15	35	50	1.5
		SUB-TOTAL							200	4.5
		TOTAL	18	3	9				800	24.0
10.	NC 351	NCC / N.S.S.	0	0	3	-	-	50**	-	0.0
11.	NC 352	PHYSICAL TRAINING	0	0	3	-	-	50**	-	0.0

CE 351 STRUCTURAL ANALYSIS - II

L T P C
3 1 0 3.5 Full Marks: 100 (70 + 30)

Unit-1: Slope Deflection Method

Degree of kinematic indeterminacy, degree of freedom, Analysis of beams and portal frames.

Unit-2: Moment Distribution Method

Analysis of beams and portal frames, Sway Analysis

Unit-3: Redundant Trusses

Analysis of trusses upto two degrees of redundancy, Lack of fit

Unit-4: Rotation Contribution Method (Kani's Method)

Analysis of beams and frames, symmetrical frames, frames with columns of unequal height

Unit-5: Plastic Method of Analysis

Theory of plastic Bending, plastic hinge, Plastic analysis – Statistical and Mechanism method

Unit-6: Moving Loads and Influence lines

Influence line for support reaction, shear Force, Bending moment in determinate beams, Maximum support reactions, maximum bending moments, shear force at a section, load position for max SF and BM at a section.

Suggested Text Books & References:

1. Wang C.K. "Indeterminate Structural Analysis", McGraw Hill
2. Reddy C.S. "Basic Structural Analysis"
3. Dr. Punmia B.C., "Strength of Materials", Vol-II, Standard Publishers
4. Jain A.K. "Advanced Structural Analysis", Nem Chand Bros., Roorkee

CE 352		GEOTECHNICAL ENGINEERING – I		
L	T	P	C	
3	0	0	3	Full Marks: 100 (70 + 30)

Introduction:

Introduction to Geotechnical Engineering; Unique nature of soil; Soil formation and soil types.

Simple Soil Properties:

Basic definitions, phase relations. Index properties of soil – Soil grain and soil properties of coarse grained and fine grained soils.

Soil Classification:

Indian standard soil classification system.

Compaction Behaviour:

Clay minerals (basic concepts) and soil structure; Compaction – Theory of compaction; Laboratory compaction tests; Different methods of compaction control.

Principle of Effective Stress and Related Phenomena:

Principle of effective stress; Capillarity; Seepage force and quicksand condition; Total Pressure and Elevation heads.

Permeability:

One dimensional flow, Permeability of soils – Darcy's law; Laboratory methods of determination; Permeability as a function of soil type, void ratio, soil fabric, and effective stress; Pumping out tests for field determination of permeability.

Seepage Through Soils:

Two dimensional flow problems – Steady flow, confined flow and unconfined flow; Flow nets and their characteristics; Uplift pressure, exit g radiant, failure due to piping; Criteria for design of filters.

Compressibility and consolidation Behaviour:

Compressibility – Effects of soil type, stress history and effective stress on compressibility; Consolidation – Factors affecting consolidation and compressibility parameters; Normally consolidated and over consolidated soils; Different forms of primary consolidation equation; Transient flow condition; Terzaghi theory of one – dimensional consolidation and time-rate of consolidation, Evaluation of compressibility and consolidation parameters from consolidometer test data.

Shear Strength Behaviours:

Introduction: Stress at a point and Mohr's stress circle, Mohr – Coulomb failure criterion; Laboratory tests for shear strength determination; Effective stress and total stress shear strength parameters; Unconfined Undrained, Confined Undrained and Confined Drained tests and their relevance to field problems; Shear strength characteristics of normally consolidated and preconsolidated clays, Shear strength characteristics of sands.

Suggested Text Books & References:

1. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics" (Revised Edition, New Age International, New Delhi.
2. Lambe T.W. and Whitman.R.V. "Soil Mechanics", John Wiley, New York.
3. Terzaghi, K. and Peck R.B., "Soil Mechanics in Engineering Practice", John Wiley, New York.
4. Taylor, D.W. "Fundamentals of Soil Mechanics", John Wiley, New York.
5. Singh Bharat and Prakash Shamsheer, "Soil Mechanics and Foundation Engineering", Nem Chand & Bros, Roorkee.
6. Punmia B.C. "Soil Mechanics and Foundation Engg."
7. Arora R.K. Dr. "Soil Mechanics and Foundation Engg."

CE 353	DESIGN OF CONCRETE STRUCTURES		
L	T	P	C
3	1	0	3.5

Full Marks: 100 (70 + 30)

Material Properties:

Properties of concrete and reinforcing steel, characteristic strengths, stress-strain specifications.

Design Philosophies: Working stress, ultimate strength and limit states of design.

Analysis and Design of Sections in Bending:

Flexure of beams by working stress and limit state methods, singly and doubly reinforced sections, T and L sections.

Shear and Bond:

Behaviour of beams in shear and bond, design for shear, anchorage and splicing of reinforcement, detailing of reinforcement.

Serviceability Conditions:

Limit states of deflection and cracking, calculation of deflections.

Design of Columns: Short and long columns, eccentrically loaded columns.

Slabs, Lintels & Staircases:

Design of one way and two way slabs; circular slabs, yield line theory for slabs, beam and slab construction, lintels and staircases.

Flat Slabs:

Introduction to flat slabs.

Torsion:

Design of beams for torsion.

Column Footings:

Isolated and combined column footings.

Cantilever Retaining Walls:

Design of cantilever type retaining walls.

Suggested Text Books & References:

1. Dayaratnam P. "Reinforced Concrete Structures", Oxford and IBH Publishing Co.,
2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Pub. Co., New Delhi.
3. Krishna, J. and Jain O.P. "Plain and Reinforced Concrete", Vol. I, Nem Chand & Bros., Roorkee.
4. Jain, A.K. "Reinforced Concrete – Limit State Design", Nem Chand & Bros., Roorkee.
5. Ram Chandra, "Design of Concrete Structures", Vol. – I, Standard book House, New Delhi.
6. Punmia B.C. "Reinforced Concrete Design", Vol.-I.

CE 354

L T

3 0

P

0

ENVIRONMENTAL ENGINEERING-I

C

3

Full Marks: 100 (70 + 30)

General:

Importance of water. Role of an Environmental Engineer. Historical overview.

Water Demand:

Design flows, design periods, design population, Factors affecting water consumption, variations in water demand, design capacities for various water supply components.

Sources of Water and Collection Works:

Alternative sources i.e., rain, surface and ground water, Assessment of yield and development of the source.

Quality of Water:

The hydrological cycle and water quality, physical, chemical and biological water quality parameters, water quality requirements, Indian standards.

Transmission of Water:

Hydraulics of conduits, selection of pipe materials, pipe materials and joints, pumps, pump stations.

Treatment of Water:

Historical overview of water treatment, water treatment processes, wastewater treatment processes (theory and application): Aeration, solids separation, settling operations, coagulation, softening, filtration; disinfection, other treatment processes: dissolved solids removal, treatment plant design, preparation of hydraulic profiles.

Distribution of Water:

Methods of distributing water, distribution reservoirs, distribution systems, distribution system components, capacity and pressure requirements, design of distribution systems, hydraulic analysis of distribution systems, pumping required for water supply systems.

Plumbing of Building for Water Supply:

Service connections, fixture units, simultaneous flow, design of plumbing system.

Suggested Text Books & References:

1. Peavy, H.S., Rowe, D.R. and Tchobanoglous, G, "Environmental Engineering", McGraw Hill Book Company, 1985.
2. Fiar, G.M., Geyer, J.C. and Okun, D.A., "Waster and Wastewater Engineering", John Wiley and Sons, Inc., 1966.
3. Viessman, Jr. and Hammer, M.J., "Water Supply and Pollution Control", Harper Collins College Publishers, 1985.
4. Gang S.K. "Water Supply Engineering".

CE 355**HYDRAULICS & HYDRAULIC MACHINERY****L T P C****3 1 0 3.5 Full Marks: 100 (70 + 30)**

Introduction – pumps, centrifugal pump, reciprocating pump, slip, indicator diagram, air vessels, hydraulic transient, specific speed, characteristic curves, cavitation, multi-stage pumps, screw pump, jet pump; Turbines, classification, Pelton Wheel, Francis Turbine, Kaplan Turbine, specific speed, selection of turbines; Mini power plant – planning; Miscellaneous hydraulic pumps and machines - submersible pump, gear pump, screw pump, sewage pump, hydraulic press, hydraulic accumulator, hydraulic ram.

Suggested Text Books & References:

1. P.N. Modi and S.M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House, 1998.
2. J. Lal, "Hydraulics Machines", Metropolitan Book Co., 1969.
3. Edited by Karassik et al., "Pumps Hand Book", Tata McGraw Hill, 1986.
4. T. Jiandong et al., "Mini Hydropower", (1st Ed.) John Wiley & Sons, 1996.

CE 256	BUILDING PLANNING & DRAWING		
L	T	P	C
3	0	0	3

Full Marks: 100 (30 + 70)

- (a) **Introduction:** Building site – its selection and comparison – site plan and its details, Orientation of buildings – Meaning factors effecting orientation, and orientation criteria; sun chart concept of sunshades and sun breakers.
- (b) **Building bye-Laws and Principles of planning:** Building bye-Laws and regulation regarding means of Access, Lines of building frontages, covered area of buildings, open space requirements, around building and their heights, size height and ventilation requirements; Plinth regulations; Projection of chajjas, sunbades, etc. provision of parking, garages, stairs, surface crains, water supply and sanitation provisions by the section of structural members.

Various principles of planning viz. aspect, prospects, privacy, Grouping, roominess, circulation flexibility Elegance, etc. – their significance with respect to site location climatic condition accommodation requirements, purpose, local bye-laws, surrounding environment, etc. Arrangement of doors, windows, cup-boards, furniture, etc. in conformity with bye-laws and building code of practice.

- (c) **Planning of Residential and Non-residential Building:** Elements of planning, functional requirements and their relationship and Accommodation requirements and only for:
- (i) Residential buildings flats, apartments, bungalows, Cottage and out-house;
 - (ii) Non-residential building. College library, school building, bank, shop office and a cinema theatre.
- (d) **Drawing**
Plan, Elevation and sectional elevation of such as Residential buildings, Educational Institutions, etc.

Suggested Text Book & References:

1. Shah, M.G. Kale, C.M. and Patki, S.Y., “Building Drawing”, Tata McGraw Hill Publishing Co. Lt d., 2nd Edition, New Delhi, 1985.
2. S.P. Arora and S.P. Bindra, “A Text Book of Building Construction”
3. JanardhanJha and S.K. Sinha, “Building Construction”
4. National Building Code of B.I.S., New Delhi.

PRACTICAL / DESIGN

CE 352P		GEOTECHNICAL ENGINEERING LAB.-I	
L	T	P	C
0	0	3	1.5

Full Marks: 75 (25 + 50)

List of Experiments:

1. Determination of moisture content of soil by
 - (a) Oven drying method.
 - (b) Pycnometer method.

2. Determination of specific Gravity of soil:
 - (a) determination of specific gravity of soil (passing 4.75 mm. IS sieve, oven dried) by Pycnometer Bottle.
 - (b) Determination of specific gravity of soil (passing 4.75mm. IS sieve and oven dried) by using Specific Gravity Bottle.

3. Determination of Grain size distribution:
 - (a) by Dry sieve Analysis (fraction passing 4.75mm. IS sieve and retained on 75 micron I.S. sieve)
 - (b) Grain size analysis by Hydrometer method (for fraction of soil passing 75 micron I.S. sieve out of the portion passing 4.75 mm. I.S. sieve)

4. Determination of limits of consistency of a soil:
 - (a) Determination of liquid limit of soil (W.L.)
 - (b) Determination of plastic limit of a soil (W.P.)
 - (c) Determination of shrinkage limit of a soil (W.S.)

5. Determination of field density of soil:
 - (a) Determination of field density of soil by Sand Replacement Method.
 - (b) Determination of field density of a soil by Core Cutter Method.

6. Determination of the permeability of soil:
 - (a) Determination of permeability by constant head method.
 - (b) Determination of permeability by falling head method.

CE 355P HYDRAULICS & HYRDAULIC MACHINERY LAB.

L	T	P	C	
0	0	3	1.5	Full Marks: 75 (25 +50)

List of Experiment:

1. To verify Darcy's law and to find out the coefficient of permeability of the given medium.
2. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
3. To study the variation of friction factor, f for turbulent flow in smooth and rough commercial pipes.
4. To determine the loss coefficients for the pipe fittings.
5. To calibrate a venturi-meter and to study the variation of coefficient of discharge with the Reynolds number.
6. To determine the Manning's Coefficient of roughness 'n' for the bed of a given flume.
7. To study the flow characteristics over a hump placed in an open channel.
8. To study the flow through a horizontal contraction in a rectangular channel.
9. To calibrate a broad crested weir and study the pressure distribution on the upstream face of a weir.
10. To study the characteristics of a free hydraulic jump.
11. To study the flow over a free overfall in an open channel to determine the end depth.

CE 256P BUILDING PLANNING & DRAWING LAB.

L	T	P	C	
0	0	3	1.5	Full Marks: 50 (15 + 35)

List of Drawings:

Based on CE 356 (Building Planning & Drawing)

THIRD YEAR SIXTH SEMESTER

SL. NO.	COURSE NO.	SUBJECT	HOURS/WEEK			MARKS				CREDIT
			L	T	P	THEORY	SESS.	PRACT.	TOTAL	
1.	CE 361	DESIGN OF STEEL STRUCTURES	3	1	0	70	30	-	100	3.5
2.	CE 362	GEOTECHNICAL ENGINEERING -II	3	1	0	70	30	-	100	3.5
3.	CE 363	ENVIRONMENTAL ENGINEERING - II	3	0	0	70	30	-	100	3.0
4.	CE 364	TRANSPORTATION ENGG.- I	3	1	0	70	30	-	100	3.5
5.	CE 365	COMPUTER APPLICATION IN CIVIL ENGG.	2	0	0	35	15	-	50	2.0
6.	CE 366/X	ELECTIVE-I	3	0	0	70	30	-	100	3.0
SUB-TOTAL									550	18.5
PRACTICAL/DESIGN										
7.	CE 362 P	GEOTECHNICAL ENGINEERING LAB-II	0	0	3	0	25	50	75	1.5
8.	CE 363 P	ENVIRONMENTAL ENGINEERING LAB.	0	0	3	0	15	35	50	1.5
9.	CE 364 P	TRANSPORTATION ENGG. LAB .	0	0	3	0	25	50	75	1.5
10.	CE 365 P	COMPUTER APPLICATION IN CIVIL ENGG. LAB.	0	0	2	0	50	-	50	1.0
SUB-TOTAL									250	5.5
TOTAL			17	3	11				800	24.0
11.	NC 361	NCC / N.S.S.	0	0	3	-	-	50**	-	0.0
12.	NC 362	PHYSICAL TRAINING	0	0	2	-	-	50**	-	0.0

CE 361 DESIGN OF STEEL STRUCTURES
L T P C
3 1 0 3.5 Full Marks: 100 (70 + 30)

UNIT 1 :

Structural Steel Sections and their properties, Methods of Design, Riveted, Bolted and Welded connections.

UNIT 2 :

Tension membes : Types of Tension members, Design of Tension members, Riveted and Welded, Slenderness Ratio, Angles, Gusset Plate.

UNIT 3 :

Compression members : Types of compression members, Column Design, Streets and Columns excluding built-up columns, lacing and battens.

UNIT 4 :

Column Bases, Tubular Structure, Beam-Column, Roof Truss Design, Purlin, Gantry Gurder.

UNIT 5 :

Bridge Design, Tanks Design, Towers Design, Plastic Methods.

Suggested Text Book & References:

1. S.K. Duggal, "Design of Steel Structures", By Limit State Method as per IS:800-2007
2. S.S. Bhavikatti, "Design of Steel Structures", By Limit State Deiju
3. N. Subramanian, "Design of Steel Structures"
4. IS Code 800 : 2007
5. Steel Table

CE 362		GEOTECHNICAL ENGINEERING - II		
L	T	P	C	
3	1	0	3.5	Full Marks: 100 (70 + 30)

Soil Exploration:

Purpose, Methods of soil exploration, Boring, sampling; Standard penetration test; Static and dynamic cone tests. Correlations between penetration resistance and strength parameters; Plate load test. Planning of soil investigation, Number of bore holes and depth of exploration; Types of tests to suit soil conditions.

Earth Pressure and Retaining Structures:

Earth pressure at rest, Active and passive earth pressure computations using Rankine's and Coulomb's earth pressure theories, Culmann's graphical construction; Additional earth pressure due to surcharge and earthquake loading. Stability analysis for retaining walls. Choice of backfill material and importance of drainage.

Foundations:

Common types of foundations with examples. Bried illustration of situations where each one of them is adopted. Basis for design.

(*a) Shallow Foundations:

Types and their selection, Terminology; Bearing capacity-Terzaghi's equation; Computation of bearing capacity Incohesionless and cohesive soils, Effect of various factors on bearing capacity; Use of field test data. Settlement Components of settlement; Limits of settlement; Stresses in soil below loaded areas; Bossiness equation for vertical stress; Concept of pressure bulb; Newmark chart; Estimation of settlement of footings and rafts on sand using penetration and load test data; Estimation of settlement of footings/rafts on cohesive soils using consolidation test data.

(*b) Pile Foundations:

Situations where adopted. Types of piles, Outline of steps involved in proportioning; Bearing capacity and settlement of single and group of piles, Proportioning with field/lab. data as input.

Embankment Slopes:

Examples of embankments – Road and earth dam embankments. Modes of failure and the usual protective measures, Slope inclinations usually adopted. Stability Analysis; Infinite slopes and the concept of factor safety, Friction circle method; Method of slices; Bishop's simplified method; Acceptable values of factor of safety; Critical conditions for the stability of earth dams, and approximate analysis.

Introduction to Machine Foundations:

Types of machines and their foundations; Terminology; Design criteria; Field methods of determining design parameters – Cyclic plate load test; Block vibration test; Response of block foundations under vertical vibrations.

Suggested Text Books & References:

1. Gopal Ranjkan and Rao A.S.R., "Basic and Applied Soil Mechanics", (Revised Edition) New Age, New Delhi.
2. Peck, R.B., Hanson, W.E. and Thornburn, W.H., "Foundation Engineering", 2nd Edition, John Wiley, New York.
3. Tomlinson, M.J., "Foundation Design and Construction", 5th Edition, ELBS, Singapore.
4. Alam Singh, "Soil Engineering in Theory and Practice", Vol. II, Asia Publishing House, New Delhi.

CE 363		ENVIRONMENTAL ENGINEERING-II		
L	T	P	C	
3	0	0	3	Full Marks: 100 (70 + 30)

General:

Terms; Sewerage, domestic sewage, sewage treatment, disposal, scope, role of an environmental engineer, historical overview.

Sewage Characteristics:

Quality parameters, BOD, COD, TOC, Solids, DO, Nitrogen, Phosphorus, Standards of disposal into natural water courses and on land, Indian standards.

Collection of Sewage:

Systems of sewerage; separate, combined, and partially separate, components of sewerage systems, systems of layout, quantity of sanitary sewage and variations, quantity of storm water, Rational method, shapes of sewer, circular and egg shaped, Hydraulic design of sewers; diameter, self cleansing velocity and slopes, Construction and testing of sewer lines, Sewer materials, joints and appurtenances. Sewage pumping and pumping stations. Maintenance of sewerage system.

Sewage Treatment:

Various units; their purposes sequence and efficiencies, Preliminary treatment; screening and grit removal units, oil and grease removal, Primary treatment, Secondary treatment, activated sludge process, trickling filter, Sludge digestion and drying beds. Stabilization pond, Septic tank, Soakage systems, Imhoff tank, Recent trends in sewage treatment, advanced wastewater treatment nutrient removal, solids removal.

Wastewater Disposal and Reuse:

Disposal of sewage by dilution, self purification of streams, sewage disposal by irrigation & sewage farming, wastewater reuse.

Plumbing for Drainage of Building:

Various systems of plumbing – one pipe, two pipe, single traps, Layout of house drainage.

Suggested Text Books & References:

1. Peavy, H.S., Rowe, D.R. and Tehobanoglous, G., "Environmental Engineering", McGraw Hill Book Company.
2. Fair, G.M., Geyer, J.C. and Okun, D.A., "Water and Wastewater Engineering", John Wiley and Sons, Inc.
3. Viessman, Jr. and Hammer, M.J., "Water Supply and Pollution Control", Harper Collins College Publishers.
4. Standard Methods for the Examination of Water and Wastewater, 19th Edition, Prepared and published jointly by APHA, AWWA, WEF.

CE 364	TRANSPORTATION ENGINEERING – I		
L	T	P	C
3	1	0	3.5

Full Marks: 100 (70 + 30)

Highway Planning:

Principles of Highway Planning, Road Development and Financing, Highway Alignment – Requirements, Engineering surveys for Highway location.

Geometric Design:

Cross section elements, Sight distances, Design of horizontal and vertical alignments.

Highway Materials:

Properties of subgrade and pavement component materials, Tests on subgrade soil, aggregates and bituminous materials, Bituminous mix design.

Pavement Design and Construction:

Factors in the design of flexible and rigid pavement, Design of flexible and rigid pavement, Pavement Construction Techniques and Quality control, Types of Bituminous pavements. Highway drainage.

Traffic Engineering:

Fundamentals of Traffic flow, Traffic field studies and their uses, Traffic control devices, Traffic Management, Prevention of Road accidents.

Air Transport Development:

Airport planning, Site selection, Obstruction and Zoning Laws, Imaginary surfaces, Approach zones and turning zones.

Runway and Taxiway Design:

Elements of runway, orientation and configuration. Basic runway length and corrections, Geometric design elements. Taxiway design, Main and exit Taxiways, Separation clearance. Holding aprons, Typical airport layouts.

Visual Aids and Air Traffic Control:

Airport marking and lighting, Airway and Airport traffic control, Instrumental landing system and other air navigation aids.

Suggested Text Books & References:

1. Khanna, S.K. and Justo, CEG, "Highway Engineering", Nem Chand & Bros.
2. Kadiyali L.R. , " Highway Engineering", Khanna Publishers, Delhi
3. Rao G.V., " Airport Engineering", Tata McGraw Hill Co. Delhi
4. Khanna S.K. Arora M.G. and Jain S.S., " Airport Planning and Design", Nem Chand and Bros.

CE 365 COMPUTER APPLICATION IN CIVIL ENGINEERING

L T P C

2 0 0 2 Full Marks: 50 (35 + 15)

Unit I :

Operators, Control statements, looping structures, arrays, functions, fundamentals and applications of various numerical methods.

Unit II :

Interpolation & Extrapolation techniques, Interactive Computer Program Development.

Unit III :

Numerical Integration techniques, Interactive Computer Program Development.

Unit IV :

linear algebraic equation solution techniques, Interactive Computer Program Development.

Unit V :

Initial & two point boundary value problems, Interactive Computer program development.

Unit VI :

Introduction to MS Excel, application of MS Excel to engineering problems.

Suggested Text Books & References:

1. Numerical Methods – S.P.Gupta
2. Numerical Methods – E Balagurusamy
3. Numerical methods for Engineers – S.Chapra, R.P.Canale
4. VBA and Macros: Microsoft Excel – Bill Jelen

CE 366/X ELECTIVE-I

L T P C

3 0 0 3 Full Marks: 100 (70 + 30)

Any one of the Following:

1. **IRRIGATION ENGINEERING**
2. **CONCRETE TECHNOLOGY**
3. **TRAFFIC ENGINEERING**
4. **PHOTOGRAMETRY AND REMOTE SENSING**

CE 366/1 IRRIGATION ENGINEERING

Introduction:

Definitions, functions and advantages of irrigation, present status of irrigation in India, soil classification for agriculture, soil moisture and crop-water relations, irrigation water quality, consumptive use of water, principal Indian crop seasons and water requirements, multiple cropping, hybrid crops.

Water Distribution System:

Rotational delivery (warabandi), continuous delivery and delivery on demand, Role of command area development authority. Functions and organisational structures.

Distribution of Canal Water:

System of regulation and control, outlets, assessment of canal revenue.

Hydraulics of Alluvial Rivers:

Critical tractive force, regimes of flow, resistance relationship for natural streams, bed load, suspended load and total load equations, different stages of rivers, meandering, aggradation and degradation, river training & bank protection works.

Canal Irrigation:

Types of canals, parts of a canal irrigation system, channel alignment, assessment of water requirements, estimation of channel losses, design of channels, regime and semi-theoretical approaches, cross-sections of channels, silt control in canals.

Water Logging:

Causes, preventive and curative measures, drainage of irrigated lands, saline and alkaline lands, types of channel linings and design of lined channel.

Principles of Design of Masonry and Other Structures for Canals:

Design for surface and sub-surface flows, Bligh's Lane's and Khosla's methods. Design of falls, distributary and cross-regulators, energy dissipation.

Well Irrigation:

Open wells and tube wells, types of tube wells, duty of tube well water.

Suggested Text Books & References:

1. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, 2nd Ed., New Delhi
2. Bharat Singh, "Fundamentals of Irrigation Engineering", 7th Edn., Nem Chand & Bros
3. Asawa, G.L. "Experimental Fluid Mechanics", Vol-2, Nem Chand & Bros, Roorkee

CE 366/2 CONCRETE TECHNOLOGY

Cement and Admixtures: Types of Portland cement, hydration, setting and hardening process, special hydraulic cements, Admixtures, accelerators, and retarders, air-entraining agents, plasticizer and super-plasticizers.

Aggregates: Shape & texture, bond, strength, specific gravity, bulk-density and moisture content of aggregates, bulking of sand, deleterious substances in aggregates, alkali-aggregate reaction, sieve-analysis and grading curves, fineness modulus, practical grading, gap grades aggregates.

Fresh Concrete: Rheological aspects such as workability-flow ability, compatibility & mobility of concrete, factors affecting workability and lab determination, segregation, bleeding & laitance.

Strength of Concrete: Compressive strength and factors affecting it, behaviours of concrete under various stress states, testing of hardened concrete-cube and cylinder test, Platen effect, flexure test, non-destructive testing such as rebound hammer, USPV, core-cutting stress-strain relation and modulus of elasticity, shrinkage, creep of concrete and its effect.

Durability of Concrete: Corrosion of reinforcing bars, sulphate attack, frost action, deterioration by fire, concrete in seawater, acid attack, carbonation.

Mix Design: Basic consideration-cost, workability, strength and durability grading, method of mix design, acceptance criteria for concrete.

Advances in Construction Materials: Higher strength concrete, fibre-reinforced concrete, concrete containing polymers, heavy weight and light weight concrete, mass concrete, blended concrete, Ferro-cements & its applications.

Suggested Text Book & References:

1. Concrete, Structure, Properties and Materials by P.K. Mehta , Prentices-Hall, Inc., New Jersey, USA
2. Properties of Concrete by A.M. Neville, Longman U.K.
3. Concrete Technology by M.L. Gambhir , Tata McGraw Hill

4. Testing of Concrete in Structures by J.H. Bungey, Surrey Univ Press, New York
5. Polymers in Civil Engg. by L. Hollaway, Thomas Telford Ltd., London
6. Special Techniques & Materials for Concrete by Dhir, Thomas Telford Ltd., London

CE 366/3 TRAFFIC ENGINEERING

Introduction:

3 Es of traffic Engineering, Special problems due to mixed traffic and other conditions in developing countries, Concept of PCU.

Traffic Characteristics:

Road user characteristics, Vehicular characteristics, Traffic flow characteristics, Capacity, Traffic studies, volume, Spot speed, Speed and delay, Origin and destination, Parking and accident.

Traffic Facilities Design:

Design of intersections – Rotary intersections, grade separated intersection, design of off – street parking facilities.

Traffic Operations and Safety:

Traffic regulations, Controls on vehicles, Drivers and flow, One way street tidal flow operation, priority for high occupancy vehicles, Traffic control devices, Signs, Signals, Islands and markings, Design of isolated traffic signals by IRC method, Analysis of traffic accidents, Highway lighting, Effect of road conditions and road geometric on traffic safety, Traffic safety awareness.

Traffic and Environment:

Pollution problems of cities, Noise pollution, Air pollution, Vibration, Environmental Impact Assessment, Mitigative Measures.

Suggested Text Books & References:

1. McShane, W.R. and Roes, R.P., "Traffic Engineering", Prentice Hall, New Jersey
2. Flaherty, CAO' (Ed.), "Transport Planning & Traffic Engineering", John Wiley & Sons. Inc., New York
3. Kadiyali, L.R., "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi
4. May, A.D. 'Traffic Flow Fundamentals", Prentice Hall, Englewood Cliffs, New Jersey

CE 366/4 PHOTOGRAMMETRY AND REMOTE SENSING

Photogrammetry:

Definition of Photogrammetric terms, Geometry of aerial and terrestrial photographs, Aerial camera and photo – theodolite, Scale of a photograph. Tilt and Height displacements. Stereoscopic vision and stereoscopes, Height determination from parallax measurements. Flight planning. Maps and Map substitutes and their uses.

Remote Sensing:

Introduction and definition of remote sensing terms, Remote sensing system. Electromagnetic radiation and spectrum, Spectral signature, Atmospheric windows. Different types of platforms. Sensors and their characteristics. Orbital parameters of a satellite, Multi concept in Remote Sensing.

Image Interpretation:

Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth-collection and verification, advantages of multiband and multiband images. Digital image processing concept.

Suggested Text Book & References:

1. Campbell, J.B., "Introduction to Remote Sensing", The Guilford Press, London
2. Curran, P.J., "Principles of Remote Sensing", Longman, London
3. Kinnie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd., London
4. Wolf, P.R., "Elements of Photogrammetry", Tata McGraw Hill Book Company, New Delhi
5. Punmia B.C., "Surveying" Vol.-III

PRACTICAL / DESIGN

CE 362P GEOTECHNICAL ENGINEERING LAB.-II

L	T	P	C	
0	0	3	1.5	Full Marks: 75 (25 + 50)

1. Determination of water content – dry density Relationship:
 - (a) determination of water content – dry density relationship by using the standard proctor test.
 - (b) Determination of water content – dry density relationship by using the modified proctor test.

2. Determination of the California Bearing Ratio (C.B.R.) for soil in the Laboratory (for remoulded and unsoaked specimen).
3. To determine in situ bearing value of sub-grade by North Dakota Cone Apparatus.
4. Direct shear test on the Dry Cohesionless/Cohesive soil specimen (Remoulded/undisturbed):
 - (a) Direct Shear Test – undrained test on cohesionless soil.
 - (b) Direct Shear Test - consolidated undrained test on cohesive soil.
5. Triaxial compression Test – unconsolidated and undrained.
6. Determination of unconfined compressive strength of cohesive soils (Remoulded/undisturbed).
7. Laboratory Vane Shear Test (Remoulded/undisturbed)
8. Swell pressure test (undisturbed/Remoulded specimen).
To determine the swelling pressure of purely cohesive soil.

CE 363P ENVIRONMENTAL ENGINEERING LAB.

L	T	P	C	
0	0	3	1.5	Full Marks: 50 (15 + 35)

List of Experiments:

1. To determine the acidity in a sample of water.
2. To determine the Alkalinity in a sample of water.
3. To determine the total hardness in a sample of water by EDTA Titrimetric method.
4. To determine the Chloride content of a sample of water.
5. To determine the amount of chlorine available in bleaching powder.
6. To determine the Dissolved Oxygen content (D.O.) in a sample of water.
7. Determination of Turbidity of a water sample – study of Turbidimeter.
8. To determine the Chlorine demand of a water sample by Break point Chlorination.

CE 364P TRANSPORTATION ENGINEERING LAB.

L	T	P	C	
0	0	3	1.5	Full Marks: 75 (25 + 50)

List of Experiments:

1. CBR test on soil
2. Impact test on aggregates.
3. Crushing test on aggregates.
4. Hardness test on aggregates.

5. Soundness test on aggregates.
6. Shape test on aggregates.
7. Specific gravity on aggregates.
8. Penetration test on bitumen.
9. Ductility test on bitumen.
10. Softening point test on bitumen.
11. Viscosity test on Tar.
12. Flash and fire point on bitumen.
13. Specific gravity test on bitumen.

CE 365P COMPUTER APPLICATION IN CIVIL ENGINEERING LAB

L T P C

0 0 2 1

Full Marks: 50 (50 + 0)

List of Practical:

1. Using MS excel prepare the detailed estimate sheet with given data and calculate the quantity using formula bar.
2. Using MS excel prepare the abstract sheet with given data and calculate the quantity using formula bar.
3. Using MS excel prepare the abstract sheet with given data and calculate amount and total amount using formula bar.
4. Using MS excel calculate the area and elongation using formula bar.
5. Using MS excel calculate the effective depth and area of steel for a rectangular singly reinforced RC beam using formula bar.
6. Using MS excel calculate the base pressure and check the stability of the masonry / RCC dam.
7. Using MS excel find centre of gravity given I, T, L and Channel section.

Suggested Text Books & References:

1. Numerical Methods – S.P. Gupta
2. Numerical Methods – E Balagurusamy
3. Numerical methods for Engineers – S.Chapra, R.P. Canale
4. VBA and Macros: Microsoft Excel – Bill Jelen

FOURTH YEAR SEVENTH SEMESTER

SL. NO.	COURSE NO.	SUBJECT	HOURS/WEEK			MARKS				CREDIT
			L	T	P	THEORY	SESS.	PRACT.	TOTAL	
1.	CE 471	CONSTRUCTION TECHNOLOGY & MANAGEMENT	3	1	0	70	30	-	100	3.5
2.	CE 472	TRANSPORTATION ENGG.- II	3	1	0	70	30	-	100	3.5
3.	CE 473	STRUCTURAL ANALYSIS - III	3	1	0	70	30	-	100	3.5
4.	CE 474	ESTIMATING & COSTING	3	1	0	70	30	-	100	3.5
5.	CE 475/X	ELECTIVE - II	3	1	0	70	30	-	100	3.5
		SUB-TOTAL							500	17.5
		PRACTICAL/DESIGN								
6.	CE 476 P	PRELIMINARY PROJECT	0	0	6	-	100	-	100	3.0
7.	CE 477 P	CIVIL ENGINEERING DRAWING	0	0	4	-	30	70	100	2.0
8.	CE 478 P	INDUSTRIAL VISIT / SURVEY CAMP								
		SUB-TOTAL							200	5.0
		TOTAL	15	5	10				700	22.5
9.	NC 471	NCC / N.S.S.	0	0	3	-	-	50**	-	0.0
10.	NC 472	PHYSICAL TRAINING	0	0	3	-	-	50**	-	0.0

CE 472 CONSTRUCTION TECHNOLOGY AND MANAGEMENT
L T P C
3 1 0 3.5 Full Marks: 100 (70 + 30)

Construction Equipment and Methods:

Equipment for earth construction and application, concrete construction, aggregate production, concrete; production, handling and placement, mixers, vibrations and temperature control.

Network Techniques:

Introduction to network techniques, Use of Computer Aided CPM and PERT for planning, scheduling and control of construction works. Computerised network scheduling and bar chart. Errors in networks. Types of nodes and node numbering systems.

Construction Planning:

Cost effective planning, Preparation of construction schedules for job, materials, equipment, labour and budgets using CPM, resources profiles & cash flow forecasting.

Cost Control of Construction Projects:

Significance of variability and estimation of risk. Construction cost control; Crashing of networks, resources leveling & cost monitoring.

Suggested Text Books & References:

1. Pilcher, R., "Appraisal and Control of Project Costs", McGraw Hill Book Company.
2. Harris, R. & McCaffer, R., "Modern Construction Management & Worked Examples", Granada Publishing.
3. Bennet, J., "Construction Project Management", Butterworths, London.
4. Moder & Philipse, "Project Management with CPM & PERT", Van Nostrand Reinhold.
5. Verma, M., "Construction, Planning & Management Through System Technique", Delhi Metropolitan.
6. Ahuja H.N., "Construction Performance control by Networks", A. Wiley Interscience Publication.

CE 472				TRANSPORTATION ENGINEERING-II
L	T	P	C	
3	1	0	3.5	Full Marks: 100 (70 + 30)

Permanent Way Component parts:

Types of rail sections creep, wear and failure in rails, Rail joints, Welding of rails, SWR and LWR sleepers requirements and types. Rail fittings, bearing plates, anti-creep devices, devices, check and guard rails. Ballast requirements, Specifications, Formation, cross section, drainage.

Geometric Design:

Alignment, horizontal curves, super elevation, equilibrium cant and cant deficiency, Length of transition curves. Gradients and grade compensation, vertical curves.

Points and Crossing:

Design of simple turn out, various types of track junction and their configurations.

Signalling and Interlocking:

Control of train movements and monitoring, types of signals, principle of interlocking, Modernisation of railways and railway tracks, High speed tracks.

Harbours:

Types of harbours, Size and accessibility, Tides, wind and wave. Dynamic effect of wave action Breakwaters and their classification, mound construction.

Docks:

Types of Docks, Shape and size, Caissons for dock entrances, Floating docks and their design considerations.

Suggested Text Books & References:

1. Aggarwal, M.M., "Railway Engineering", Student Edition, Prabha & Co., New Delhi.
2. Saxena, S.C. and Arora, S.P., "A Text Book of Railway Engineering", Dhanpat Rai & Sons.
3. Mundrey, J.S., "Railway Track Engg.", Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Track Manuals of Indian Railways.
5. Indian Railways Permanent Way Manual.

CE 473 STRUCTURAL ANALYSIS – III
L T P C
3 1 0 3.5 Full Marks: 100 (70 + 30)

Unit-1: Approximate Analysis of Frames for vertical loads substitute Frame, Loading for max B.M., Two cycle method of moment distribution

Unit-2: Analysis of Frames for Lateral loads Cantilever method, Portal method.

Unit-3: Flexibility matrix Method Analysis of beams by Flexibility matrix method

Unit-4: Stiffness matrix method Stiffness matrix, Analysis of beams

Unit-5: Influence lines Influence lines for members of trusses, influence line for horizontal thrust, bending moment, radial shear and normal thrust in three hinged arch.

Unit-6: Muller Breslan Principle Influence lines for support reactions, bending moments, shear force in propped cantilever and two span continuous beam

Suggested Text Books & References:

1. Basic Structural Analysis, C.S. Reddy.
2. Indeterminate Structures, R.L. Jindal, S. Chand & Co.
3. Advanced Structural Analysis, P. Dayaratnam.
4. Indeterminate Structural Analysis, J.S. Kinney, McGraw Hill.
5. Matrix Method of Structural Analysis, Pandit.

CE 473	ESTIMATING AND COSTING		
L	T	P	C
3	1	0	3.5

Full Marks: 100 (70 + 30)

Methods Of Building Estimate:

Long-short wall method, centre line method, crossing method-including semi-circular, Hexagonal, Octagonal, and Segmental bay front of building.

Estimate Of Building:

Estimate of masonry platform, water tank, detailed estimate of single story and double storied residential and public buildings with Kitchen, bath, front and back verandahs having different ceiling heights, Estimate of building having hexagonal semi-circular and segmental bay front, Abstract of Costs.

R.C.C. Works:

Types of bars and shapes and calculation of their length. Estimate of R.C.C. lintel, Beam (singly and doubly reinforced). Square column, circular column and cantilever beams.

Earth Works:

Different methods of calculating earth work for roads, hilly roads, canals and embankments.

Culverts And Bridges:

Methods of finding out the length of abutments and wing walls below bed level and above bed levels. Detailed estimate of slab and Arch culverts with straight, return-type and splayed with walls.

Analysis Of Rates:

Rates of materials and labour, calculation of materials of different items of works, Detailed analysis of all items of building projects such as earth work, concrete, brick work, mortar D.P.C., roofing of various types flooring, plaster and pointing woodwork painting, white washing, varnishing etc.

Detailed Specifications:

Detailed specifications of various items of works of building. Projects such as earth work, concreting D.P.C. Stone masonry, brick work, flooring, roofing, vanishing, distempering, white washing colour washing, and wood work.

Contracts and Agreements:

Various types of contracts and agreement, tenders, Notice inviting tenders, tender documents, contract documents escalation factor, termination of contract, measurement of works measurement book muster-roll.

Accounts:

Essential requirement of accounts: P.W.D, system of accounts, classification of transactions, Head of accounts, list of standard objects of expenditure.

Suggested Text Books & References

1. Estimating and Costing, B.N. Dutta.
2. Estimating and Costing, H. Chakraborty.
3. Estimating and Costing, S.P. Mahajan.

CE 475/X ELECTIVE–II
L T P C
3 1 0 3.5 Full Marks: 100 (70 + 30)

Any one of the Following:

1. **PRE-STRESSED CONCRETE.**
2. **ELEMENTS OF BRIDGE ENGINEERING.**
3. **GEOTECHNICAL PROCESS.**
4. **WATER RESOURCES ENGINEERING.**

CE 475/1 PRESTRESSED CONCRETE STRUCTURES**Prestressing Systems, Materials & Codes:**

Basic concepts, systems, materials and their properties, losses of prestress, I.S. and I.R.C. specifications.

Design of Beams:

Analysis and design of section for bending and shear, bending of cables, limit state analysis and design, anchorage zone stresses, design of end block, Application to bridges.

Beams – Columns & Ties:

Sections subjected to bending and thrust, tension members, circular prestressing.

Circular Prestressing:

Equipment and applications.

Continuous Beams and Portal Frames:

Design concepts, concordancy of cables, Secondary design considerations.

Partial Prestressing:

Principles and advantages.

Suggested Text Books & References:

1. Dayaratnam, P., "Prestressed Concrete Structures", Oxford & IBH Publishing Co., Pvt. Ltd., 5th Edition.
2. Lin, T.Y. & "Design of Prestressed Concrete Structures", John Wiley & Sons, 3rd Edition.
3. Nilson, A.H., "Design of Prestressed Concrete", John Wiley & Sons, 1978.
4. Naaman, A.E., "Prestressed Concrete Analysis & Design", McGraw Hill Book Company.
5. Raju, N.K., "Prestressed Concrete", Tata McGraw Hill Publishing Company Limited, 3rd Edition.

CE475/2 ELEMENTS OF BRIDGE ENGINEERING

General Considerations:

Types of bridges, economic spans, aesthetics, selection of suitable type of bridge.

Design Loads and Their Distribution:

IRC loads, railway loading, analysis of deck slab for IRC loads, load distribution among longitudinal beams of a bridge.

Design of Superstructure:

Design of balanced cantilever concrete bridge, Introduction to R.C. arch bridge, Prestressed concrete bridge and box girder bridge. Design of lattice girder railway bridge.

Design of Substructure:

Different types of foundations, their choice and method of construction. Design of well foundation, Design of piers and Abutments, Various types of bearings and their design.

Construction Methods:

Introduction to construction methods, erection of bridge super structures, cantilever construction.

Suggested Text Books & References:

1. Victor D.J., "Essential of Bridge Engineering", Oxford & IBH Publishing Co., Pvt. Ltd.
2. Raju, N.K., "Design of Bridges", Oxford & IBH Publishing Co. Pvt. Ltd., Second Edition.
3. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill Publishing Co., Pvt. Ltd., New Delhi.
4. Bakht, B and Jaeger, L.G., "Bridge Analysis Simplified", McGraw Hill Book Company.
5. Raina, V.K., "Concrete Bridge Practice", Tata McGraw Hill Publishing Co. Ltd.
6. Pama, R.P. and Cusens, A.R., 'Bridge Deck Analysis', John Wiley & Sons.

CE475/3 GEOTECHNICAL PROCESS

Dewatering:

Methods, selection, analysis and design of dewatering system.

Grouting:

Types of grouts and their properties; Methods of grouting; Grout selection and control.

Compaction:

Diffused double layer theory of compaction; Methods of compaction; Engineering properties of compacted soil; Field compaction and its control.

Soil Stabilisation:

Stabilisation using chemical additives and other methods.

Reinforced Earth:

Concept, materials, application and design of reinforced earth wall.

Suggested Text Books & References:

1. Tomlinson, M.J. "Foundation Design and Construction", 5th Ed., ELBS, Singapore, 1988.
2. Swami Saran, "Analysis and Design of Substructures", Oxford & IBH, New Delhi, 1996.
3. Alam Singh, "Modern Geotechnical Engineering", IBT Publishers, Delhi, 1987.
4. Leonards, G.A. (Ed), "Foundation Engineering", McGraw Hill, New York, 1962.
5. Lee, I.K., White, W. and Ingles, O.G., "Geotechnical Engineering", Pitman Marshfield, Mass (U.S.A.), 1983.

CE 475/4 WATER RESOURCES ENGINEERING

Introduction:

Role of water in national development, assessment of water resources of country, scope of water resources development vis-à-vis environment.

Planning:

Water resources planning process; planning for single purpose and multipurpose projects, estimation of different water needs and project formulations, comparison of alternatives; cost-benefit analysis; introduction to optimization techniques and systems approach.

Management:

Evaluation and monitoring of water quantity and quality, managing water distribution networks for irrigation, flood control and power generation, inter-

basin transfer of water, conjunctive use of surface and ground water, water quantity and quality modelling, evaluation of impacts of water resources projects on river regimes and environment, reservoir sedimentation and watershed management.

Suggested Text Books & References:

1. Good Man, A.S., "Principles of Water Resources Planning", Prentice Hall, Inc., Englewood Cliffs, N.J. 1984.
2. Linsley, R.K. and Franzini, J.B., "Water Resources Engineering", 3rd Edition, McGraw Hill, New York, 1979.
3. S.K. Garg, "Water Resources Engineering".

CE 476P PRELIMINARY PROJECT
L T P C
0 0 6 3 Full Marks: 100 (Sessional)

Details of Preliminary project to be decided by dept.

CE 477P CIVIL ENGINEERING DRAWING
L T P C
0 0 4 2 Full Marks: 100 (30+70)

LIST OF DRAWINGS:

1. Detail Drawing of R.C. C. Framed Building.
2. Detail Drawing of T-Beam Bridge
3. Detail Drawing of Elevated Water Tank (Steel)
4. Detail Drawing of Retaining Walls
5. Detail Drawing of Earthen Dams
6. Detail Drawing of Barrage
7. Detail Drawing of Septic Tank
8. Detail Drawing of Water Treatment Plant
9. Detail Drawing of Caisson Foundation Detailing
10. Detail Drawing of Steel Truss Details
11. Detail Drawing of RCC Water Tank
12. Detail Drawing of Slab Culvert

CE 478P INDUSTRIAL VISIT/SURVEY CAMP
L T P C
0 0 0 0 Full Marks: 50(Practical – Non credit)

FOURTH YEAR EIGHTH SEMESTER

SL. NO.	COURSE NO.	SUBJECT	HOURS/WEEK			MARKS				CREDIT
			L	T	P	THEORY	SESS.	PRACT.	TOTAL	
1.	CE 481/X	ELECTIVE – III	3	0	0	70	30	-	100	3.0
2.	CE 482/X	ELECTIVE – IV	3	0	0	70	30	-	100	3.0
3.	CE 483/X	ELECTIVE – V	3	0	0	70	30	-	100	3.0
		SUB-TOTAL							300	9.0
		PRACTICAL/DESIGN								
4.	CE 484P	PROJECT/ THESIS	0	0	18	-	120	280 (UNIV. EXAM)	400	9.0
5.	CE 485P	SEMINAR	0	0	3		50		50	1.5
		SUB-TOTAL							450	10.5
		GRAND TOTAL	9	0	21				750	19.5
6.	NC 481	SOFT SKILL – II	3	0	0	-	50**	-	-	-
7.	NC 482	PLACEMENT/ PHYSICAL TRAINING	0	0	3	-	-	50**	-	0.0

CE 481/X ELECTIVE–III

L T P C

3 0 0 3 Full Marks: 100 (70 + 30)

CE 482/X ELECTIVE–IV

L T P C

3 0 0 3 Full Marks: 100 (70 + 30)

CE 483/X ELECTIVE–V

L T P C

3 0 0 3 Full Marks: 100 (70 + 30)

LIST OF ELECTIVES (Select any three-one each for CE 481, CE 482 & CE 483)

1. THEORETICAL GEOMECHANICS
2. ENVIRONMENT, POLLUTION AND CONTROL
3. ADVANCED HIGHWAY ENGINEERING
4. FINITE ELEMENT METHODS IN ENGINEERING
5. ADVANCED STRUCTURAL MECHANICS
6. PAVEMENT MANAGEMENT SYSTEMS
7. ADVANCED DESIGN OF CONCRETE STRUCTURES
8. DESIGN OF FOUNDATION AND RETAINING STRUCTURES
9. GROUND IMPROVEMENT AND GROUND ENGINEERING
10. GROUND WATER HYDROLOGY AND MANAGEMENT
11. ENVIRONMENTAL MANAGEMENT
12. SOLID WASTE ENGINEERING
13. EARTHQUAKE ANALYSIS AND DESIGN.
14. WATER POWER ENGINEERING.

1. THEORETICAL GEOMECHANICS

Unit 1 :

Analysis of stress and strain, Equilibrium equations - Compatibility equations - stress strain relationship. Generalized Hooke's law. Octahedral shear, Stress function .Plane stress and plane strain - Simple two dimensional problems in Cartesian and polar co-ordinates. Deviator stress.

Unit 2 :

Stresses in Soil: Description of state of stress and strain at a point, stress distribution problems in elastic half space Boussnesque's analysis for concentrated force. Pressure bulb. Uniformly loaded circular and rectangular areas. Newmark influence diagram. Vertical and horizontal line loads. Uniform vertical load over a strip. Principal stress and maximum shear. Triangular and other loadings. Westergaard's analysis. Burmister's two layer theory. Stress distribution around tunnels and vertical shafts.

Unit 3 :

Rheological properties of material-equation of state, models, stress deformation behaviour of soil subject to loading, solution of problems of linearly elastic solids. Deformation of Rheological constants. Pore pressure developed, settlement computations.

Unit 4 :

Failure theories, Yield criteria , Tresca, Von Mises , Mohr-Coulomb failure conditions. Failure loci in deviatoric plane and principal stress space, influence of intermediate principal stress on failure. Constitutive Models in Soil Mechanics: Isotropic Elastic, Anisotropic Plasticity and Viscous Models. Representing Soil Behaviour using these Models. Advances in Constitutive models.

Suggested Text Book &References :

1. Timoshenko, S. and Goodier J.N., "Theory of Elasticity", McGraw Hill Book Co., New York
2. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, New Delhi,
3. Slater R.A.C, "Engineering Plasticity", John Wiley and Son, New York,
4. Chou P.C. and Pagano, N.J. "Elasticity Tensor, Dyadic and Engineering Approaches", D. Van Nostrand Co., Inc., London,
5. Scott R. F. "Principles of Soil Mechanics", Addison & Wesley,
6. Harr M.E, "Theoretical Soil Mechanics",
7. Selvadurai A.P.S., "Plasticity & Geomechanics", Cambridge University Press,
8. Chen W.F., "Limit Analysis & Soil Plasticity", Elsevier Scientific,
9. Desai C.S. and Christian, J.T. "Numerical Methods in Geotechnical Engineering", McGraw Hill, New York,

2. ENVIRONMENT, POLLUTION AND CONTROL

General:

Introduction, components of the environment, basic ecological principles, environmental degradation.

Air Pollution and Control:

Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.

Water Pollution and Control:

Hydrosphere, natural water, pollutants, their origin and effects, river/lake/ground water pollution, standards and control.

Land Pollution:

Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes), their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

Noise Pollution:

Sources, effects, standards and control.

Suggested Text Books & References:

1. Masters, G.M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd.
2. Nebel, B.J., "Environmental Science", Prentice-Hall Inc.

3. ADVANCED HIGHWAY ENGINEERING

Pavement Materials, Pavement as multilayered structure, sub-grade, base and sub-base, bituminous materials, individual properties, non-linear models of granular materials and bituminous mixes elastic modules and Poisson's ratio, concrete pavement, Pavement Design, AASHTO, Shell, Asphalt Institute, Japan, Austroads methods, analytical pavement design, Indian context, overlay design, Pavement Management, Pavement evaluation, Benkelman beam and Falling Weight Deflectometer, pavement maintenance management, financial viability.

Suggested Text Book & References:

1. D. Croney and P. Croney, The Design and Performance of Road Pavements, 2nd Edition, McGraw-Hill, International Series in Civil Engineering

2. Ministry of Surface Transport, Government of India, Specification for Road and Bridge Work, 3rd revision, Published by IRC
3. E. J. Yoder and M. W. Witzczak, Principles of Pavement Design, 2nd Edition, John Wiley & Sons.

4. FINITE ELEMENT METHODS IN ENGINEERING

Basic concepts of engineering analysis, Methods of weighted residuals and variational formulations, Finite element discretization, Shape function, Lagrange and serendipity families, Element properties, Iso-parametric elements, Criteria for convergence, Numerical evaluation of finite element matrices (Gauss quadrature integration), Assemblage of elements, Analysis of plane stress/strain, axi-symmetric solids, Three dimensional stress analysis, Poisson's and Laplace equations, Flow through porous media, Solution technique; Finite element programming, Use of package programs.

Suggested Text Book & References:

1. T. R. Chandrapatula and A. D. Belegundu, Introduction to finite elements in engineering, Third Edition, Prentice Hall of India
2. P. Seshu, Text book of finite element analysis, Prentice Hall of India
3. J. N. Reddy, An introduction to the finite element method, McGraw Hill Inc.
4. R. D. Cook. D. S. Malkus. M. E. Plesha, and R. J. Witt, Concepts and application of finite element analysis, fourth Edition, John Wiley & Sons
5. O.C. Zienkiewicz and R.L.Taylor, The Finite element method, Butterworth Heinemann (Vol I and Vol. II)
6. C.S. Krishnamoorthy, Finite Element Analysis, Theory and programming, Tata McGraw Hill
7. K.J. Bathe, Finite Element Procedures in Engg. Analysis, Prentice Hall of India

5. ADVANCED STRUCTURAL MECHANICS

Bending of curved beam. Beams on elastic foundation– infinite, semi- infinite and beams of finite length. Analysis of thin plates – Navier's and Levy's solution for rectangular plate, Circular plates. Buckling of column and frames, energy method for computing critical load. Cylindrical shell membrane theory. Dynamic system: discrete and continuous, Lagrange & Hamiltons formulation, Free and forced vibration analysis- convolution integral, mode superposition technique. Approximate methods.

Suggested Text Book & References:

1. S. Timoshenko, Strength of materials – Advanced theory and problems, Vol-II, Van Nostrand,
2. S.P. Timoshenko and S.W.Krieger, Theory of plates and shells, McGraw Hill,
3. D.G. Fertis, Advanced Mechanics of Structures, Marcel Dekker,
4. A. Chajes, Principle of structural stability, Waveland Press,
5. R. W. Clough, J. Penzien and R. W. Clough, Dynamics of structures, McGraw Hill,
6. L. Meirovitch, Methods of Analytical Dynamics, McGraw Hill,

6. PAVEMENT MANAGEMENT SYSTEMS

Introduction to Pavement Management Systems, Functional and structural condition of pavements, Pavement network, Pavement Distress survey, Rating procedures, Present Serviceability concept, Roughness Measurement and analysis, IRI Index, Skid Resistance Measurement, Structural Evaluation of Pavements by Nondestructive testing, Back calculation Analysis, Pavement strengthening based on Deflection data, Pavement Distress Identification and equipment, Pavement Condition Prediction Models, Maintenance and rehabilitation techniques, Network and project level Management, PMS based on analytical empirical method, Future Directions and Research needs in PMS, Highway Development and Management (HDM) for road project investments.

Suggested Text Book & References:

1. M.Y. Shahin, Pavement Management for Airports, Roads and Parking lots, Chapman & Hall
2. R. Haas, W. R. Hudson, and J.P. Zaniewski, Modern Pavement Management, Krieger Publishing Company
3. W.R. Hudson, R. Haas and W. Uddin, Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation, McGraw Hill
4. H. Yang, Pavement Analysis and Design, Huang, Prentice-Hall, Inc. Englewood Cliffs

7. ADVANCED DESIGN OF CONCRETE STRUCTURES

Elements of Prestressed concrete:

Principles and systems, material properties, losses of prestress, I.S. specifications, analysis and design of sections for flexure and shear, Introduction to continuous beams.

Continuous and Curved Beams:

Design of continuous R.C. beams, moment redistribution, beams curved in plan.

Shrinkage and Creep:

Effect of shrinkage and creep on stresses in R.C. columns and beams.

Multistoreyed Building Frames:

Analysis by approximate methods, design and detailing, I.S. specification and loading standards.

Water Tanks and Towers:

Water Tanks and Water Towers-design of rectangular, circular and Intze type tanks, column brace type staging and circular raft foundations.

Culverts and Bridges:

Design of slab culverts, bridge decks, cross and main beams for bridges, T-beam bridge design for I.R.C. loadings.

Suggested Text Books & References:

1. Krishna Jai and Jain, O.P., "Plain and Reinforced Concrete", Vol. II, Nem Chand and Bros., Roorkee, 1998.
2. Chandra Ram, "Design of Concrete Structures", Vol. II, Standard Book House, New Delhi, 1986.
3. Gray, W.S. and Manings, G.I., "Reinforced Concrete Water Towers", Bunkers, Silos & Gantries', Concrete Publication Limited, 1973.

8. DESIGN OF FOUNDATION AND RETAINING STRUCTURES

Advanced bearing capacity theories; Design of shallow foundations: strip footings, isolated footings, combined footings, rafts; Design of deepfoundations: single piles, pile groups, pile caps, caissons, vertical uplift and lateral capacity; Design of retaining structures: rigid and flexible walls, coffer dams, diaphragm walls, braced cuts.

Suggested Text Book & References:

1. J.E. Bowles, Foundation Analysis and Design, McGraw Hill
2. P.N. Kurian, Design of Foundation Systems : Principles & Practices, Narosa ,
3. M.J. Tomlinson, Foundation Design and Construction, Addison Wesley,
4. M.J. Tomlinson, Pile Design and Construction Practice, E & FN Spon,
5. R. B. Peck, W. E. Hanson and T. H. Thornburn, Foundation Engineering, John Wiley & Sons,

9. GROUND IMPROVEMENT AND GROUND ENGINEERING

Soil compaction: laboratory methods, field methods, compaction control; Soil stabilisation: using additives, sand drains, stone columns, lime columns; Grouting: types of grouts, methods of grouting; Soil reinforcement: using strips, geogrids, geotextiles, geomembranes; Dewatering methods; Soil nailing; Underpinning; Tunneling.

Suggested Text Book & References:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley & Sons, 1969.
2. K. Terzaghi, R. B. Peck and G. Mesri, Soil Mechanics in Engineering Practice, John Wiley & Sons, 1996.
3. M. R. Hausmann, Engineering Principles of Ground Modification, McGraw Hill,

10. GROUND WATER HYDROLOGY AND MANAGEMENT

Introduction to groundwater hydrology; Well and aquifer characteristics; Groundwater flow in aquifers, groundwater recharge, fluctuation of water table beneath a recharge site; Hydraulics of fully and partially penetrating wells in confined, leaky and unconfined aquifers under steady and transient conditions; Analysis of pumping test data; Groundwater investigations; Basin management of groundwater and groundwater quality; Model studies; Sea water intrusion.

Suggested Text Book & References:

1. D.K. Todd, Groundwater Hydrology, John Wiley & Sons, 1993.
2. C. Walton, Groundwater Resources Evaluation, McGraw Hill, 1970.
3. H.M. Raghunath, Groundwater Hydrology, New Age International, 1993.
4. O.D.L. Strack, Groundwater Mechanics, Prentice Hall, 1989.
5. S.P. Garg, Groundwater and Tube Wells, Oxford & IBH Publishing Co., 1993.

11. ENVIRONMENTAL MANAGEMENT

The need for environmental awareness and protection in both natural and man-made systems – effects on atmosphere, water, ecological systems and quality of life. Environmental Impact Assessment and Integrated Environmental Management, Practical applications – cradle to grave concept, life cycle analysis, clean technologies. Environmental Audit, Compliance Audit; Concept of ISO and ISO 14000. Needs of developing countries. Governmental standards for Environmental Protection. Emerging Global Environmental Issues. Environmental Legislation.

Suggested Text Book & References:

1. R. G. John and W. C. David, Environmental Impact Analysis Handbook, McGraw-Hill, 1980.
2. R F Fuggle and M A Rabie, Environmental Management in South Africa, Juta & Co. Ltd., Johannesburg, 1991.
3. R M Harrison (Ed.), Pollution – Causes, Effects and Control, Whitstable Lithop Ltd, 1990.
4. L. W Canter, Environmental Impact Assessment, McGraw-Hill.

12. SOLID WASTE ENGINEERING

Solid waste- history, materials flow, the need for integrated solid waste management; Municipal solid waste-characteristics and quantities; Collection Systems-municipal wastes; commercial wastes, recyclable materials; Material separation and processing of municipal solid waste; Combustion and energy recovery-heat value, materials and thermal balances, combustion

hardwares, undesirable effects; Biochemical process-anaerobic digestion, composting and other processes; Landfills-planning, siting, landfill processes, landfill design, landfill operations, post-closure care and use of old landfills; Current issues in solid waste management.

Suggested Text Book & References:

1. P. A. Vesilind, W. A. Worrel and D. R. Reinhart, Solid Waste Engineering, Thomson Brooks/Cole, First Edition, 2002.
2. H. S. Peavy, D. R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw-Hill International Ed, 1985.
3. M. L. Davis and D. A. Cornwell, Introduction to Environmental Engineering, McGraw-Hill, Inc, International Edition, 1991.
4. A. P. Sincero and G. A. Sincero, Environmental Engineering – A Design Approach, Prentice- Hall India, 1996

13. EARTHQUAKE ANALYSIS AND DESIGN

Behaviour of Structures in Past Earthquakes:

Lessons learned with regards to weak/strong aspects of structural systems.

Ground Motion Characteristics:

Choice of ground motion for a major project site.

Study of IS-1893:

Seismic analysis of building and design consideration.

Study of IS-13920:

Ductile detailing.

Introduction of Seismic Design:

Consideration of bridges, Dams, Chimneys, base isolation.

Vulnerability of Building:

Use of Vulnerability atlas and understanding Techno-legal issues with regard to building.

Concept in Repair, Restoration and Seismic Strengthening:

Retrofitting, weakness in existing building, ageing, weathering, development of cracks, materials and equipments for repairs, of masonry and concrete structures, study of IS-13935.

Methodologies of Repairs:

Walls, roofs, slabs, columns and foundation of building.

Suggested Text Books & References:

1. Earthquake Risk Management: Department of Earthquake Engineering IIT, Roorkee, Lecture Notes for NPCBEERM
2. Earthquake Resistant Design of Structures: Pankaj Agarwal and Manish Shrikhande, PHI, New Dehi
3. Earthquake Resistant Design of Structures: S.K. Duggal, Oxford.

14. WATER POWER ENGINEERING

Water power utilization principles, power from flowing streams, demand for power, role of storage and pondage in water power development, firm power and secondary power. Types of water power developments : Run-off river, storage, pumped storage, tidal and others, characteristics and layout of low, medium and high head hydropower developments. Conveyance of water : Channels, Penstocks, flumes and tunnels. Surges in open channels and water hammer and surges in closed conduits following rapid load changes in the hydro-power plant. Forebays and surge tanks.

Water turbines : Selection of water turbines, scroll castings and draft tubes, Speed regulation and governing of turbines. Power house : Types of power house, substructure and superstructure. General arrangement and space requirements for standard power house facilities.

Suggested Text Books & References:

1. W.P. Creager and J.D. Justin, 'Hydro-electric Hand Book', John Wiley.
2. M.M. Dandekar and K.N. Sharma, 'Water Power Engineering', Vikas Publishing House, New Delhi.
3. P.N. Modi, 'Irrigation, Water Resources and Water Power Engg.', Standard Book House, New Delhi.

CE 484P		PROJECT / THESIS		
L	T	P	C	
0	0	18	9.0	Full Marks: 400 (120 + 280)

Details of the Project / Thesis is to be decided by the Department.

CE 485P		SEMINAR		
L	T	P	C	
0	0	3	1.5	Full Marks: 50 (Sessional)

Seminar to be presented by each student on latest topics related to Civil Engineering.

NC 481 SOFT SKILL – II

L	T	P	C	
3	0	0	0	Full Marks: 50 (Sessional - Non Credit)

UNIT I-NUMBERS

Types and Properties of Numbers, LCM, GCD, Fractions and decimals, Surds

UNIT II-ARITHMETIC – I

Percentages, Profit & Loss, Simple Interest & Compound Interest, Clocks & Calendars

UNIT III-ALGEBRA-I Logarithms, Problems on ages

UNIT IV-MODERN MATHEMATICS - I Permutations, Combinations, Probability

UNIT V-REASONING Logical Reasoning, Analytical Reasoning

ASSESSMENT

1. Objective type – Paper based / Online – Time based test

Suggested Text Books & References:

1. Agarwal.R.S– Quantitative Aptitude for Competitive Examinations, S.Chand Limited 2011
1. AbhijitGuha, Quantitative Aptitude for Competitive Examinations, Tata McGraw Hill, 3rd Edition, 2011
2. Edgar Thrope, Test Of Reasoning for Competitive Examinations, Tata McGraw Hill, 4th Edition, 2012

NC 482 PLACEMENT / PHYSICAL TRAINING

L	T	P	C	
0	0	3	0	Full Marks: 50 (Practical - Non Credit)