



**VIVEKANANDA GLOBAL
UNIVERSITY, JAIPUR**

(Established by Rajasthan State Legislature and covered u/s 2(f) of the UGC Act, 1956)

FACULTY OF ENGINEERING & TECHNOLOGY

SCHEME & SYLLABUS

FOR

**Bachelor of Technology
(Civil Engineering)**

(Academic session 2017-18)

Sem	III	IV	V	VI	VII	VIII	Total
Credits	24.5	25	24.5	24	25	16	139

Total Credits: 50 (I & II Semester) + 139 (III to VIII Semester) = 189

SESSION: 2017-18

**VIT Campus, Sector-36, NRI Road, Sisyawas, Jagatpura, Jaipur (Raj.)-303012
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VIVEKANANDA GLOBAL UNIVERSITY, JAIPUR**

**TEACHING AND EXAMINATION SCHEME FOR
BACHELOR OF TECHNOLOGY
(CIVIL ENGINEERING)**

III SEMESTER

Sr. No.	Subject Code	Subject Title	Teaching Hours (Per Week)			Credits
			Theory	Tutorial	Practical/ Sessional	
1	MAT 104	Advanced Engineering Mathematics	3	1	-	3.5
2	BCE 302	Surveying-I	3		-	3
3	BCE 303	Fluid Mechanics	3	1	-	3.5
4	BME 302	Strength of Materials	3	1	-	3.5
5	BCE 305	Engineering Geology	2	1	-	2.5
6	BCE 306	Building Materials & Construction	3	-		3
7	BCE 307	Fluid Mechanics Lab-I	-	-	2	1
8	BCE 308	Material Testing Lab			2	1
9	BCE 309	Building Constructions Drawing with computer			2	1
10	BCE 310	Surveying Lab-I	-	-	3	1.5
11	BCS 305	Object Oriented Programming with C++ Lab	-	-	2	1
Total			17	4	11	24.5

IV SEMESTER

Sr. No.	Subject Code	Subject Title	Teaching Hours (Per Week)			Credits
			Theory	Tutorial	Practical/Sessional	
1	BCE 401	Advance Strength of Materials	3	1	-	3.5
2	BCE 402	Advanced Fluid Mechanics	3	1	-	3.5
3	BCE 403	Environmental Engg.-I	3	1		3.5
4	MGT 101	Sociology & Elements of Economics	3			3
5	BCE 405	Concrete Technology	3		-	3
6	BCE 406	Surveying-II	3		-	3
7	BCE 407	Fluid Mechanics Lab-II	-	-	2	1
8	BCE 408	Concrete Technology Lab	-	-	2	1
9	BCE 409	Surveying lab –II	-	-	3	1.5
10	BCE 410	Environmental Engg. Lab-I			2	1
11	BCE 411	CAD LAB	-	-	2	1
Total			18	3	11	25

V SEMESTER

Sr. No.	Subject Code	Subject Title	Teaching Hours (Per Week)			Credits
			Theory	Tutorial	Practical/ Sessional	
1	BCE 501	Theory of Structures	3	1	-	3.5
2	BCE 502	Design of Steel Structures-I	3			3
3	BCE 503	Design of Concrete Structures-I	3		-	3
4	BCE 504	Environmental Engg.-II	3	1	-	3.5
5	BCE 505	Geotechnology-I	3	1	-	3.5
6	BCE 506	Project Planning & Management	2		-	2
7	BCE 507	Structural Mechanics Lab-I	-	-	2	1
8	BCE 508	Geotechnology Lab-I	-	-	2	1
9	BCE 509	Steel Structures Design –I	-	-	2	1
10	BCE 510	Environmental Engg. Lab – II			2	1
11	BCE 511	Concrete Structures Design -I	-	-	2	1
12	BCE 512	Design of water and waste water systems	-	-	2	1
Total			17	3	12	24.5

VI SEMESTER

Sr. No.	Subject Code	Subject Title	Teaching Hours (Per Week)			Credits
			Theory	Tutorial	Practical/ Sessional	
1	BCE 601	Design of Steel Structures-II	3			3
2	BCE 602	Irrigation Engineering	3		-	3
3	BCE 603	Design of Concrete Structures-II	3		-	3
4	BCE 604	Geotechnology-II	3	1	-	3.5
5	BCE 605	Transportation Engineering-I	3		-	3
6		Department Elective-I	3	1	-	3.5
7	BCE 606	Road material testing Lab	-	-	2	1
8	BCE 607	Geotechnology Lab-II	-	-	2	1
9	BCE 608	Steel Structures Design –II			2	1
10	BCE 609	Concrete Structures Design - II	-	-	2	1
11	BCE 610	Staad-Pro	-	-	2	1
Total			18	2	10	24

Note: Students shall devote 6 weeks to training after Sixth semester examination outside the College campus at approved works.

VII SEMESTER

Sr. No.	Subject Code	Subject Title	Teaching Hours (Per Week)			Credits
			Theory	Tutorial	Practical/Sessional	
1	BCE 701	Water Resources & Systems Engineering	3	1	-	3.5
2	BCE 702	Transportation Engg.-II	3		-	3
3		Departmental Elective-II	3	1	-	3.5
4		Departmental Elective-III	3	1	-	3.5
5		Departmental Elective-IV	3	1	-	3.5
6	MGT 102	Entrepreneurship Development	3	-	-	3
7	BCE 704	Project-I	-	-	4	2
8	BCE 706	Practical Training Report	-	-	2	1
9	BCE 707	MX Road	-	-	2	1
10	BCE 708	Design Of Water Resources Structures			2	1
Total			15	4	12	25

VIII SEMESTER

Sr. No	Subject Code	Subject Title	Teaching Hours (Per Week)			Credits
			Theory	Tutorial	Practical/Sessional	
1	BCE 801	INDUSTRIAL TRAINING (INTERNSHIP)				16

Departmental Elective-I

CODE	SUBJECT	L	T	P/D	CREDITS
BCE 612	Hydro Electric Power Development	3	1	-	3.5
BCE 613	River Mechanics & Flood Control	3	1	-	3.5
BCE 614	Bridge Engineering	3	1	-	3.5
BCE 615	Rock Mechanics	3	1	-	3.5
BCE 616	Solid Waste Management	3	1	-	3.5

Departmental Elective-II

CODE	SUBJECT	L	T	P/D	CREDITS
BCE 714	Machine Foundations	3	1	-	3.5
BCE 715	Advanced composite materials for structures	3	1	-	3.5
BCE 716	Renewable Source of Energy	3	1	-	3.5
BCE 717	Elements of Earthquake Engineering	3	1	-	3.5
BCE 718	Transport Planning	3	1	-	3.5
BCE 719	Fundamentals of Energy and Climate Change	3	1	-	3.5
BCE 720	Site Organization and Management	3	1	-	3.5

Departmental Elective-III

CODE		SUBJECT	L	T	P/D	CREDITS
BCE 721		Advanced Traffic Engineering	3	1	-	3.5
BCE 722		Ground Water Hydrology	3	1	-	3.5
BCE 723		Design of Hydraulic Structures	3	1	-	3.5
BCE 724		Repair & rehabilitation of structure	3	1	-	3.5
BCE 725		Environmental Impact Assessment	3	1	-	3.5
BCE 726		Design of multi story structures	3	1	-	3.5
BCE 735		Quantity Surveying and Valuation	3	1	-	3.5

Departmental Elective-IV

CODE		SUBJECT	L	T	P/D	CREDITS
BCE 727		Introduction to Finite Element Method	3	1	-	3.5
BCE 728		Structural Optimization	3	1	-	3.5
BCE 729		Geo-synthetics Engineering	3	1	-	3.5
BCE 730		Seismic Design of structures	3	1	-	3.5
BCE 731		Architecture and town Planning	3	1	-	3.5
BCE 732		Disaster Management	3	1	-	3.5
BCE 733		Remote Sensing & GIS	3	1	-	3.5
BCE 734		Industrial Waste Water Treatment	3	1	-	3.5

Module 1

Fourier Series and Method of Separation of Variables (Boundary Value Problems): Expansion of simple functions in Fourier series, half range series, change of interval, harmonic analysis, application to the solution of wave equation and diffusion equation in one dimension and Laplace's equation in two dimensions by method of separation of variable.

Module 2

Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac's delta function, Differentiation and integration of transforms, Applications to differential equations.

Module 3

Errors and significant digits, Roots of algebraic equations Bisection method, secant method, Newton Raphson method, Graff's root- squaring method, Iterated synthetic division with quadratic factors method for finding complex roots.

Module 4

Forward, Backward, Central and Divided differences, Newton's formula of interpolation for equal and unequal intervals. Lagrange's interpolation formula, Stirling's and Bessell's formula, Solutions of systems of equations (Gauss elimination, Gauss Jordan and Partition method for linear system of equations, power method for partition, method for linear system of equations, power method for finding Eigen values).

Module 5

Numerical solution of simultaneous algebraic equation by Gauss elimination and Gauss Seidel method. Numerical differentiation, Numerical integration- Trapezoidal rule, Simpson's one third and Simpson's three eight rule. Numerical solution of ordinary differential equation of first order-Picard's method, Euler's method, and Modified Euler's method, Milne's methods and Runga Kutta fourth order method.

Text/Reference Books:

- 1 Numerical Method, Dr. B.S. Gravel, Khanna Publication, DARYA GANJ, Delhi - 110003, India
- 2 Numerical Methods, S.uha, R. Shrinivasan, Oxford Publication.
- 3 Numerical Methods, M.K. Jain ,R.K. Jain, New Age Publication, New Delhi.
- 4 Higher Engg. Mathematics, B.V. Ramana, TATA MCGRAW HILL PUBLISHING COMPANY; Place: New Delhi.
- 5 Higher Engineering Mathematics, B.S. Grewal, Khanna Publication, DARYA GANJ, Delhi – 110003.

BCE 302 SURVEYING – I

3L+0T+0P+3C

MM: 100

Module 1

Introduction: Importance of surveying to engineers, Plane and geodetic surveying, methods of location of points, principle of surveying from whole to part, conventional signs.

Measurement of Distances: Different types of chains, tapes and their uses. Sources of error and Precautions, corrections to tape measurements, Field problems in distance measurement, Advance techniques of distance measurements.

Module 2

Measurement of Angles & Directions: Different types of direction measuring instruments and their uses. Reference meridians, Bearing and azimuths, magnetic declination and its variation. Use and adjustment of surveyors and prismatic compass. Vernier and micro-optic theodolite, temporary and permanent adjustment of vernier theodolite. Measurement of horizontal and vertical angle by different methods.

Module 3

Traversing: Different methods of traversing; chain traverse, chain & compass traverse, transit-tape traverse. Methods of computations and adjustment of traverse; transit rule, Bowditch rule, graphical method, axis method. Gales traverse table.

Module 4

Leveling: Definitions of various terms in leveling. Different types of leveling, sources of errors in leveling, curvature and refraction corrections. Temporary and permanent adjustment of dumpy and tilting levels. Computation and adjustment of levels. Profile leveling; L-Section and cross-sections.

Module 5

Plane Table Surveying: Introduction of plane table Surveying, Area and Volume measurement Area Calculation: Area of regular boundaries by mathematical formulae, use of trapezoidal & Simpson's formula, their limitations. Planimeter (construction, use & area calculations), use of zero circle & solution of numerical problems. Elements of plane table survey working operations, methods of plane table survey; intersection, traversing and resection, two point and three point problems.

Contouring: Characteristics of contours, contour interval, contour gradient, Methods of locating contours, uses of contour maps.

Text/Reference Books:

1. Plane Surveying by Dr. A.M. Chandra, New Age International.
2. Surveying Volume I by Dr. B.C. Punmia Laxmi Publications (P) Ltd.
3. Surveying Volume –I & II by Dr. K.R. Arora Standard Book House Delhi
4. Surveying & Leveling by Subramanian Oxford University Press.
5. Surveying Vol.1 by S. K. Duggal Tata McGraw Hill, Delhi.

BCE 303 FLUID MECHANICS

3L+1T+0P+3.5C

MM: 100

Module 1

Basic Definitions & Fluid Properties: Definition of Fluid, Incompressible and compressible fluids, Fluid as a continuum, mass, density, specific weight, relative density, specific volume, bulk modulus, velocity of sound, Ideal fluid viscosity, Newtonian and Non Newtonian fluid, kinematic viscosity, effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitations.

Module 2

Fluid Statics: General differential equation, hydrostatics manometer, fluid forces on submerged surfaces, curved surfaces, aerostatics, Isothermal atmosphere, polytrophic atmosphere, static stability, the international atmosphere, submerged bodies, floating bodies.

Module 3

Kinematics & Conservation Of Mass: Flow classifications, Fluid velocity and acceleration, streamlines and the stream function, path lines and streak lines, deformation of a fluid element, vorticity and circulation. Irrotational and rotational flow, flow net, Laplace equation, conservation of mass and the continuity equation for three dimensions.

Fluid Momentum: The Momentum theorem, applications of the momentum theorem, equation of motion, Euler's equation of motion, Integration of Euler's equation of motion, Bernoulli's equation, applications of Bernoulli's pilot tube, equation of motion for viscous fluid, Navier Stoke's equation.

Module 4

Orifice Discharging: Free Jet, vena contracts, co-efficient of contraction, velocity and discharge, coefficient of resistance, orifices and mouthpieces, nozzles and weires.

Flow Through Pipes: Reynold's experiment, Darcy's Weisbach equation, loss of head due to sudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings, total and hydraulic gradient lines, Flow through pipe line, pipes in series, parallel, transmission of power through pipes.

Module 5

Laminar Flow: Simple solution of Navier Stokes equations, Hagen – Poiseuille flow, Plans Poiseuille flow and coutte flow.

Turbulent Flow: Variation of friction factor with Reynold's number, Prandtl's mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, rough pipes, Universal pipe friction laws, Colebrook White formula. Introduction to boundary layer theory.

Text/Reference Books:

1. Fluid Mechanics, Frank M. White, McGraw-Hill Publications.
2. Fluid Mechanics, Cengel and Cimbala, Tata McGraw-Hill, New Delhi.
3. Fluid Mechanics by Dr. K.R. Arora, Standard Publishers and Distributers, Delhi.
4. Fluid Mechanics by Dr. R.K. Bansal, Laxmi Publication (P) Ltd.
5. Fluid Mechanics by Modi & Seth, Standard Publishers, Delhi.

BME 302 STRENGTH OF MATERIALS**3L+1T+0P+3.5C****MM: 100****Module 1**

Stress & Strain: Concepts and analysis of stresses and strains; Stress-strain relationships; mechanical properties; ductile and brittle materials; Hooke's law; relations of Elastic constants for a isotropic and hookean material, thermal stresses, hoop stress & strains in pressure vessels, composite bars; simple elastic, stress due to self weight ,bar of uniform strength, Concept of factor of safety & permissible stress, Tensors.

Module 2

Shear Force & Bending Moment: Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams. Bending stresses, Section modulus. Transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc.

Module 3

Principle Stresses: Principle planes, stresses & strains: Members subjected to combined axial, bending & Torsional loads, maximum normal & shear stresses; Concept of equivalent bending & equivalent twisting moments. Mohr's circle of stress & strain.

Theories Of Elastic Failures: The necessity for a theory, different theories, significance and comparison, applications.

Module 4

Torsion: Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity.

Columns: Instability & elastic stability. Long & short columns, ideal strut, Euler's formula for crippling load for columns of different ends, concept of equivalent length, eccentric loading, Rankine formulae and other empirical relations.

Module 5

Transverse Deflection Of Beams: Transverse deflection of beams and shaft under static loading, area moment method, direct integration method, method of superposition and conjugate beam method.

Elastic Strain Energy : Strain energy due to axial, bending and Torsional loads; stresses due to suddenly applied loads; use of energy theorems to determine deflections of beams and twist of shafts. Castigliano's theorem. Maxwell's theorem of reciprocal deflections.

Text/Reference Books:

1. 1 Mechanics of Materials, James M. Gere, Cengage Learning (Brooks\Cole).
2. Mechanics of Material, Pytel and Kiusalaas, Thomson (Brooks\Cole).
3. An Introduction to the Mechanics of Solids, Crandall, Dahl and Lardner, Tata McGraw Hill.
4. Mechanics of Materials, Beer, Johnston, Dewolf and Mazurek, Tata McGraw Hill.
5. Strength of Materials, Ryder G.H., Macmillan India.
6. Strength of Materials, Sadhu Singh, Khanna Publishers.
7. Mechanics of Material, Punmia, Jain and Jain, Laxmi Publications.

BCE 305 ENGINEERING GEOLOGY

2L+1T+0P+2.5C

MM: 100

Module 1

General Geology: Branches and Scope of Geology, Internal Structure of the Earth, Types of Weathering & Geological work of natural agencies like River & Wind. Geological Time Scale. Physical Properties of Minerals.

Module 2

Petrology: Formation, Texture, Structure and Classification of Igneous, Sedimentary and Metamorphic Rocks. Engineering Properties of Rocks for Building & Road Material. Laboratory and Field & in-situ Test for Site Construction.

Module 3

Structural Geology: Causes, Terminology, Classification, Recognition, Effects and Engineering consideration of Fold, Fault, Joints and Unconformities. Dip & Strike Problems.

Module 4

Engineering Geology: Geophysical methods as applied to Civil Engineering for Subsurface Analysis (Electrical and Seismic methods). Terminology, Types and Geological consideration for site selection of Dam & Tunnel.

Module 5

Remote Sensing & GIS: Remote Sensing & GIS System, Nature of Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interactions with Earth's Surface Materials, Remote Sensing Platforms & Sensor's Characteristics. Application, Advantages and Limitations of Remote Sensing and GIS in Various fields of Civil Engineering.

Text/Reference Books:

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

BCE 306 BUILDING MATERIALS & CONSTRUCTION

3L+0T+0P+3C

MM: 100

Module 1

Masonry Construction: Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

Cavity and Partition Walls: Advantages, position of cavity, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall. **Foundation:** Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.

Module 2

Damp-Proofing and Water-Proofing: Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs. **Roofs and Floors:** Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings. **Doors and Windows:** Locations, sizes, types of doors and windows, fixtures and fasteners for doors and windows.

Module 3

Stones: Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone. **Brick and Tiles:** Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks. **Tiles:** Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta. **Limes, Cement and Mortars:** Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement. Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

Module 4

Timber: Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, fiberboard, masonite and its manufacturing, important Indian timbers. **Ferrous and Non-Ferrous Metals:** Definitions, manufacturing of cast iron, manufacturing of steel from pig iron, types of steel, marketable form of steel, manufacturing of aluminum and zinc.

Module 5

Paints and Varnishes: Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes. **Plastic:** Definition, classification of plastics, composition and raw materials, manufacturing, characteristics and uses, polymerization, classification, special varieties.

Text/Reference Books:

1. Building Construction, Sushil Kumar, Standard Pub., N. Delhi
2. Building Material, Rangawala
3. Construction Engineering, Y.S. Sane
4. Building Construction, Gurcharan Singh, Standard Pub., N. Delhi.
5. The text book of building construction by S.P. Arora and S.P. Bindra, Dhanpat Rai publication

BCE 307 FLUID MECHANICS LAB

0L+0T+2P+1C

MM: 100

List of Experiments:

1. Determine Metacentric height of a given body.
2. Determine C_d , C_v and C_c for given orifice.
3. Determine flow rate of water by V-notch.
4. Determine velocity of water by pitot tube.
5. Verify Bernoulli's theorem.
6. Determine flow rate of air by Venturimeter.
7. Determine flow rate of air by orifice meter.
8. Determine head loss of given length of pipe.
9. Determine flow rate of air by nozzle meter.

BCE 308 MATERIAL TESTING LAB

0L+0T+2P+1C

MM: 100

List of Experiments:

1. Izod Impact testing.
2. Rockwell/Vickers/Brinell's Hardness Testing of a given material
3. Spring Testing
4. Column Testing for buckling
5. Torsion Testing
6. Tensile Testing
7. Fatigue testing

Text/Reference Books:

1. Vander Voort, Metallographic: Principles and Practice, McGraw-Hill, 1984
2. Prabhudev K.H., Handbook of Heat Treatment of Steels, Tata McGraw-Hill, 2000.
3. Suryanarayanan, A.V.K. "Testing of Metallic materials" TataMcGraw Hill,1993

BCE 309 BUILDING CONSTRUCTIONS DRAWING WITH COMPUTER

0L+0T+2P+1C

MM: 100

List of Experiments:

- 1. Building Components** –Drawing of walls in brick and stone masonry, partition wall, cavity wall and cross section of external wall. Pointing, Arches, Lintels and Floors. Doors and Windows. Stairs, cross section of Dog legged stairs. Roofs: Flat and Inclined (Steel). Foundations for Masonry Structures and Framed Structures, Provision of Damp Proof Course

- 2. Building Planning** –
 - a) Development of Front Elevation and Sectional Elevation from a given plan
 - b) Development of Plan, Front Elevation and Sectional Elevation from line diagram.

BCE 310 SURVEYING LAB – I

0L+0T+3P+1.5C

MM: 100

List of Experiments:

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

BCS 305: OBJECT ORIENTED PROGRAMMING LAB WITH C++

0L+0T+2P+1C

MM:100

1. Create a user defined function (any) and use it inside the program.
2. Implement “call by value” & “call by reference “ function call techniques by using any user defined functions.
3. Implement the working of classes and objects by using any real world object.
4. Create a Stack object model in C++ & also make use of default and parameterized constructor to make the class more flexible in use.
5. Make all the member functions, including constructors, non-inline in the above class.
6. Create any user defined class using the concept of static data and member functions.
7. Create a Class or program implementing the concept of passing and returning object to/from member functions.
8. WAP to implement polymorphism through function overloading (Area of different shapes).
9. Create a user defined type Complex and do all the Complex number arithmetic. And also make use of operator overloading.
10. Implement single level inheritance by using Student and Marks class.
11. Implement multilevel inheritance by using the Stack class.
12. Demonstrate the calling mechanism of constructors and destructors in Multilevel Inheritance.
13. Create generic Stack model for storing different types of data.
14. Create a user defined type Matrix and perform all matrix operations. Also make use of operator overloading.
15. Implement the concept of Abstract classes and virtual functions by using Shape, Rectangle and Triangle class.

BCE 401 ADVANCE STRENGTH OF MATERIALS

3L+1T+0P+3.5C

MM: 100

Module 1

Deflection of Beams: Differential relation between load, shear force, bending moment, and slope deflection. Slope & deflection in determinate beams using, Macaulay's method

Module 2

Analysis of prop cantilever structures, Analysis of Indeterminate Structure using Conjugate beam method Combined direct and bending stress, middle third rule, core of a section, gravity retaining wall.

Module 3

Fixed Beams & Continuous Beams: Analysis of fixed beams & continuous beams by three moments Theorem and Area moment method.

Module 4

Torsion: Elementary concepts of torsion, shear stress in solid and hollow circular shafts, angle of twist, power transmitted by a shaft, combined bending and torsion.

Truss: Analysis of Indeterminate truss structures up-to two degree. Calculation of deflection for determinate truss structures.

Module 5

Springs: Stiffness of springs, springs in series and parallel, laminated plate springs, leaf spring, close coiled helical springs, open coiled springs.

Text/Reference Books:

1. Strength of Material by Singer and Pytel, Harper Collins Publishers.
2. Mechanics of Structures by Timoshenko & Gere, CBS Publishers and Distributers.
3. Mechanics of Structures Vol. I & II by S.B Junarkar, Charotar Publishing House.
4. Strength of Materials & Mechanics of Structures: Vol. I by Dr. B.C. Punmia, Laxmi Publications (P) Ltd.

BCE 402 ADVANCE FLUID MECHANICS

3L+1T+0P+3.5C

MM: 100

Module 1

Dimensional Analysis & Models: Dynamical Similarity and Dimensional Homogeneity Model Experiment, geometric, Kinematic and Dynamic similarity. Reynold's, Froude's, Weber's, Euler's and Mach numbers. Distorted river models and undistorted models, proper choice of scale ratios. Scale effect. Principle of dimensional analysis, Rayleigh's method, Buckingham's π theorem, applications of dimensional analysis to pipe Friction problems, resistance to motion of partially and fully submerged bodies and other simple problems. Ship model experiments.

Module 2

Flow through channels: Uniform, Non-Uniform and variable flow. Resistance equations of Chezy, Manning and Bazin. Section factor for uniform flow. Most Efficient rectangular, triangular and trapezoidal sections. Equations of gradually varied flow in Prismatic channels. Limitation of its applicability and assumption made in its derivation. Specific energy of flow. Critical depth in prismatic channels. Alternate depths. Rapid, critical and sub critical Flow Mild, steep and Critical Slopes. Classification of surface curves in prismatic channels and elementary computation.

Module 3

Rapidly varied flow: Hydraulic jump or standing wave in rectangular channels. Conjugate or sequent depths Losses in jump, location of jump. Broad crested weirs for channel flow: Measurement, velocity distribution in open channels, Parshall flume. Elementary water hammer concept.

Module 4

Impact of free Jets: Impact of a jet on a flat or a curved vane, moving and stationary vane, flow over radial vanes.

Module 5

Centrifugal pumps and turbines: Volute and whirlpool chambers, Losses of head due to variation of discharge Manometric and Hydraulic efficiencies, Description of single and multistage pumps. Specific speed, characteristic curves. Model Test. Reaction and Impulse turbines, specific speed, fixed flow turbines. Pelton wheel turbine, Francis turbine, propeller turbine and Kaplan turbine efficiency, Characteristics of turbines. Basic principles of governing of turbines, Draft-tube, Selection of turbines, model tests.

Text/Reference Books:

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

BCE 403 ENVIRONMENTAL ENGINEERING-I

3L+1T+0P+3.5C

MM: 100

Module 1

General: Environment and its components, Importance of water, Role of an Environmental Engineer, Historical overview.

Water Demand: Design flow, design periods, Design population, factors affecting water consumption, variation in water demand, design capacities for various water supply components.

Module 2

Source 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.

Module 3

Transmission of Water: Hydraulics of conduits, selection of pipe materials, pipe joints, pumps, pumps station.

Preliminary Treatment of Water: Historical overview of water treatment, water treatment processes (theory and application): aeration, solids separation, settling operations, coagulation, softening.

Module 4

Advanced Treatment of Water: filtration, disinfection, other treatment processes, dissolved solids removal, treatment plant design, preparation of hydraulic profiles.

Module 5:

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

Plumbing of Building For Water Supply: Service connections, fixture units, simultaneous flow, design of plumbing system.

Text/Reference Books:

1. Water Supply by S.K. Garg, Khanna Publishing Co.
2. Environmental Engineering by Peavy, H.S., Rowe D.R. and Techobanoglous, Mc Graw Hill, Book Company.
3. Manual of Water Supply and Water Treatment, Ministry of Urban Development, Govt.of India
4. Water Supply by B.C. Punmia, Laxmi Publication.

MGT 101: SOCIOLOGY AND ELEMENTS OF ECONOMICS

3L+0T+0P+3C

MM 100

MODULE 1: Introduction to sociological concepts-structure, system, organization, social institutions, Culture social stratification (caste, class, gender, power). State & civil society. Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development.

MODULE 2: Socialization: Meaning, Types, Agents& Process. Social Group: Concepts, Characteristics and Types. Ecology and Environment.

MODULE 3: Basic Principles and Methodology of Economics. Demand/Supply-elasticity-.Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income)

MODULE 4: Public Sector Economics – Welfare, Externalities, Demand & Supply of Labor. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve

MODULE 5: Liberalization, Privatization & Globalization (LPG): Concept, Reasons for implementation of LPG and Pros & Cons of Liberalization, Privatization & Globalization (LPG) , Indian economy Brief overview of post independence period – plans

Text book/ Reference books

- 1 Indian Economy,DuttGaurav&MahajanAshwani, S Chand
- 2 Sociology and element of Economics for engineers, B Shalini, K Aman, T Deepika,Neelkant
- 3 Sociology, Giddens, A, Polity, 6thedn.
- 4 Sociology, Haralambos M, RM Heald, M Holborn,Collins
- 5 State, Society and Tribes Person, Xaxa, V,
- 6 Contemporary India: Economy, Society and Politics, Chandoke, Neera& Praveen Priyadarshi,Pearson
- 7 Class, Caste & Gender, Mohanty, M,Volume 5, Sage
- 8 Industry and Labour, Ramaswamy, E.A, and Ramaswamy, UOU Press
- 9 Street Vendors in the Global Urban Economy, Bhowmik, S (ed.), Routledge
- 10 Urban Sociology, Rao, M.S.A. (ed.), Orient Longmans
- 11 Managerial Economics, V. Mote, S. Paul, G. Gupta, Tata McGraw Hill

BCE 405 CONCRETE TECHNOLOGY

3L+0T+0P+3C

MM: 100

Module 1

Ingredients of Concrete: Cement: hydration of cement and its basic compounds, structure of hydrated cement, C-S-H gel, heat of hydration, gel-space ratio and its significance.

Aggregates: types, physical properties and standard methods for their determination.

Concrete :Grade of concrete, proportioning of ingredients, water content and its quality for concrete, water/cement ratio and its role, Properties of fresh concrete including workability, air content, Flow ability, Segregation, Bleeding and Viscosity etc. -Factors affecting, methods of determination.

Module 2

Concrete Handling in Field: Batching, mixing, placing and transportation of concrete, equipments for material handling, various methods their suitability and precautions. Compaction of concrete: methods & equipments. Curing of concrete: various methods their suitability. Durability of concrete.

Module 3

Properties of hardened concrete such as strengths, permeability, creep, shrinkage, factors influencing, Standard tests on fresh and hardened concrete as per IS code. Aggregate- cement interface, maturity concept.

Module 4

Concrete mix design (Indian standard method) quality control for concrete.

Admixture in Concrete: Chemical and mineral admixtures, their types and uses: water reducers, Accelerator, retarders, water-proofing plasticizers, super plasticizers, air-entraining agents. Use of fly ash and silica fume in concrete, their properties and effect.

Module 5

Special Types of Concrete: Introduction to high strength concrete, high performance concrete, sulphate resisting concrete, under water concreting, self-compacting concrete, pumpable concrete: their salient properties and application.

Text/Reference Books:

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

BCE 406 SURVEYING – II

3L+0T+0P+3C

MM: 100

Module 1

Trigonometric Leveling: Methods of trigonometric leveling direct method and reciprocal method, axis Signal corrections. Determination of difference in elevations of points.

Module 2

Curve Surveying: Elements of circular (Simple, compound and reverse) curves, transition curves, degrees of curves Methods of setting out circular and transition

Module 3

Triangulation: Merits and demerits of traversing, triangulation and trilateration. Grades of triangulation, Strength of figure, field procedure of triangulation. Reconnaissance and selection of triangulation stations. Inter-visibility of stations and calculation of the heights of towers. Equipment needed for base line measurement, corrections to base line. Satellite station and base line extension.

Module 4

Errors in Surveying: Classification of errors in surveying. The probability curve, its equation and properties, theory of least squares, weight, most probable value, probable errors, standard errors. Normal equation correlates.

Adjustment of Triangulation Figures: Adjustment of levels. Adjustment of triangulations figures, Braced quadrilateral Triangle with central, station. Approximate and method of least squares for figure adjustment, Trilateration.

Module 5

Field Astronomy: Definitions of terminology used in Astronomy, Co-ordinate Systems. Relationships between different Co-ordinate systems. Astronomical Triangle, Napier's Rule. Different methods of determination of Azimuth.

Electronic distance measurement and use of Total station.

Survey camp: (including exercise on triangulation, topographic, or project survey) with duration of maximum 10 days.

Text/Reference Books:

1. Surveying Volume II by Dr. B.C. Punmia Laxmi Publications (P) Ltd.
2. Surveying & Leveling by Subramanian Oxford University Press.
3. Surveying Vol.2 by S.K. Duggal Tata McGraw Hill, Delhi.
4. Plane Surveying by Dr. A.M. Chandra, New Age International.

BCE 407 FLUID MECHANICS LAB -II

0L+0T+2P+1C

MM: 100

List of Experiments:

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

BCE 408 CONCRETE TECHNOLOGY LAB

0L+0T+2P+1C

MM: 100

List of Experiments:

1. To determine the fineness of Cement by sieving through a 90 micron I.S. Sieve.
2. To determine Soundness of cement by Le-chatelier apparatus.
3. To determine water absorption of coarse aggregate.
4. To determine the fineness modulus of coarse aggregates and fine aggregates by sieve analysis.
5. To determine the workability of given concrete mix by slump test.
6. To determine the workability of given fresh concrete mix by compaction factor test.
7. To determine the optimum dose of super plasticizers by Flow table test.
8. To design concrete mix of M-20 grade without admixture in accordance with I.S. recommendations.
9. Rebound Hammer Test.
10. To determine the Strength of Concrete by Ultrasonic Pulse Velocity Test

BCE 409 SURVEYING LAB-II

0L+0T+3P+1.5C

MM: 100

List of Experiments:

1. To measure the horizontal and vertical angles by Theodolite.
2. To determine the Height of an object by trigonometrical leveling (single plane method).
3. To determine the Height of an object by trigonometrical leveling (two plane method).
4. To shift the R.L. of known point by double leveling.
5. To measure and adjust the angles of a braced quadrilateral.
6. To prepare a contour map by indirect contouring.
7. To prepare the map of given area by plane tabling.
8. To determine the Azimuth of a given line by ex-meridian observations of Sun.
9. Survey Camp.

BCE 410 ENVIRONMENTAL ENGINEERING LAB-I

0L+0T+2P+1C

MM: 100

List of Experiments:

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

BCE 411 CAD LAB

0L+0T+2P+1C

MM: 100

1	Introduction to Engineering Drawings, Projections (First & Third angle), Views (Orthographic, Isometric & Perspective), Introduction to AutoCAD, History, Exploring GUI, Workspaces, Coordinate systems
2	Drawing settings - Units, Limits, Drawing Tools: Line, Circle, Arc, Ellipse, Donut, Polygon, Rectangle,
3	Modify Tools: Erase, Undo, Redo, Explode, Move, Copy, Rotate, Mirror, Trim, Extend, Offset. File Management - New, Open, Save, Save as, Close, Exit, Quit
4	Array- Rectangular, Polar, Path. Array edit, Drafting Setting.
5	Editing Commands- Fillet, Chamfer, Scale, Stretch, Break, Join.
6	Display Control: Zoom, Pan, Regen, Drawing Tools: Multiline, Pline, Spline, Xline, Ray, Modify Tools: Mlstyle, Mledit, Pedit, Splinedit, Grip Editing, Blend Curve.
7	Object Properties: Color, Linetype, Ltscale, Line weight, Properties, Match prop,
8	Layer Management, Adding / Removing Layers, Layer Status, New Property Filter, New Group Filter, Layer Status Manager
9	Annotation Tools: Text Style, Mtext, Scaletext, Spell, Table, Tablestyle, Tabledit
10	Isometric View Drawings, Perspective View Drawings, One Point & Two Point
11	Object Selection Methods, Select, Qselect, Filter, Symbol & BOM Creation Block, Base, Wblock, Insert), Attribute (Attdef, Attedit), Design Centre, Tool Palette
12	Hatching utilities - Hatch, Hatchedit, Gradient, Boundary, Region, Wipeout, Revision cloud, Fill, Fillmode.
13	Dimension - Linear, Aligned, Radius, Diameter, Center Mark, Angle, Arc length, Continuous, Baseline, Tolerance, Dimension Space, Dimension Break, Inspection, Jogged radius, Ordinate dimensions.
14	Leader, Qleader, Mleader, Multi leader style, Add leader, Dimension Associative, Reassociate, Dimension Style
15	Geometric Constraints, Constraint Bar, Auto Constraint, Dimensional Constraint, Dynamic Dimensions, And Constraint Setting.
16	Tool Menu- Ribbon, Clear Screen, Command Line, Calculator, Isolate Objects, Draw Order, Group, Ungroup. Inquiry commands - Id, Dist, List, Radius, Angle, Area, Volume.
17	OLE Object, Hyperlink, Copy, Copy base, Copy link, Paste, Paste special, Paste block, Paste original, External references - Xref, Xbind, Xopen, Raster Image, Field, Update Field
18	Etransmit, Publish, Publish to Web, Introduction to plotting, Layout, Viewports, Mview, Page setup, Plot Styles, Plot

BCE 501 THEORY OF STRUCTURES

3L+1T+0P+3.5C

MM: 100

Module 1

Introduction of Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Maxwell's law of reciprocal deflection and Betti's reciprocal theorem.

Module 2

Analysis of Statically Indeterminate Structures using Slope-deflection and Moment-distribution methods. **Kani's Method.**

Module 3

Column Analogy method for indeterminate structures, determination of carry over factor for non-prismatic sections. Conjugate beam method for analysis of indeterminate structures.

Module 4

Arches: Analysis of three hinged, two hinged parabolic and circular arches with supports at the same level and at different levels.

Cable and Suspension bridges: Analysis of cables with concentrated and continuous loading, analysis of two & three hinged stiffening girder.

Module 5

Approximate methods for lateral loads: Analysis of multistory frames by portal method. Analysis of determinate space trusses by tension coefficient method.

Influence line diagram & Rolling load: ILD for beams & frames, Muller-Breslau principle and its application for drawing ILD, Rolling load, maximum stress resultants in a member/section, absolute maximum stress resultant in a structure.

Text/Reference books:

1. Strength of Materials & Mechanics of Structures: Vol. I by Dr. B.C. Punmia Laxmi Publications (P) Ltd.
2. Mechanics of Structures by Timoshenko & Young, McGraw Hill Book Co.
3. Mechanics of Structures Vol.-I by Junarkar & Shah, Charotar Publishing House.
4. Theory of Structures by Jangid & Negi, Tata Mc Graw Hill.
5. Structural Analysis by Ghali & Neville, E&FN,Spon.
6. Structural Analysis by Hibbler R.C., Pearsons

BCE 502 DESIGN OF STEEL STRUCTURES–I

3L+0T+0P+3C

MM: 100

Module 1

Introduction: Types of steels and properties of steel.

Plastic Analysis: Plastic analysis of steel structures, fundamentals, static and mechanism method of analysis, bending of beams of rectangular and I sections beams, shape factor.

Classification of Cross Sections: As per IS 800-2007 Plastic, compact, semi compact, slender sections, their characteristics including moment- rotation.

Module 2

Connections: Types of bolts, load transfer mechanism, prying action. Design of bolted and welded connections under axial and eccentric loadings.

Tension Members: Design strength in gross section yielding, net section rupture and block shear. Design of axially loaded tension members.

Module 3

Compression Member: Types of buckling. Column buckling curves, Imperfection factor, Buckling curves for different cross sections. Design of compression member; Axially loaded compression members including angle section design: single and in pair, built up columns, design of lacings and battens.

Module 4

Beams: Design of beams: simple and compound sections, main and subsidiary beams and their connections. Laterally supported and unsupported beam design, Web buckling, web crippling, lateral torsional buckling.

Module 5

Member design under combined forces: Compressive load and uniaxial moment. Tension and uniaxial moment

Column Bases: Design of column bases, Slab base, gusseted base for axial and eccentric compressive load. Grillage foundation design.

Text/Reference Books:

1. Design of Steel Structures by N. Subramanian, Oxford University Press.
2. Limit state Design of Steel Structures: S K Duggal, TMH publication
3. Design of Steel Structures by S. Bhavikatti, I.K. International Pvt. Ltd.
4. Design of Steel Structures by V.L. Shah, Structures Publications.

BCE 503 DESIGN OF CONCRETE STRUCTURES-I

3L+0T+0P+3C

MM: 100

Module 1

Design Philosophies: Working stress, ultimate strength and limit states of design. Introduction to working stress method. Analysis and Design of prismatic Sections in flexure using limit state methods: singly and doubly reinforced prismatic sections and lintels.

Module 2

Design of one way slabs: Shear and Bond: Behavior of beams in shear and bond, design for shear, anchorage, curtailment and splicing of reinforcement, detailing of reinforcement. serviceability Conditions: Limit states of deflection and cracking, calculation of deflections & crack width as per codal provisions.

Module 3

Design of two way slabs and flat slabs by direct design method.

Module 4

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

Module 5

Design of Column Footings: Isolated and combined column footings and circular raft foundations.

Text/Reference Books:

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

BCE 504 ENVIRONMENTAL ENGG. –II

3L+1T+0P+3.5C

MM: 100

Module 1

General: Terms: sewerage, domestic sewage, sewage treatment, disposal scope, Role of an Environmental engineer, historical overview. Sewage Characteristics: Quality parameters: BOD, COD, TOC, Solids, DO, Nitrogen, Phosphorus, Standards of disposal into natural watercourses and on land, Indian standards.

Module 2

Collection of Sewage: Systems of sewerage, Separate, combined, and partially separate, components of sewerage systems, systems of layout, quantity of sanitary sewage and variations, quantity of storms water, rational method, shapes of sewer, Hydraulic design of sewers: diameter self cleansing velocity and slopes, construction and testing of sewer line, Sewer materials, joints and appurtenances, Sewage pumping and pumping stations.

Module 3

Sewage Treatment: Various units: their purpose, sequence and efficiencies, preliminary treatment, screening and grit removal units, oil and grease removal, primary treatment, secondary treatment, activated sludge process, trickling filter, sludge digestion and drying beds,

Module 4

Low Cost Sanitation Systems: Im-hoff tanks, septic tank, soakage pit/soil absorption systems; stabilization ponds, macrophyte ponds, oxidation ponds, and constructed wetland systems. Advanced wastewater treatment: nutrient removal, solids removal.

Module 5

Wastewater Disposal and Reuse: Disposal of sewage by dilution, self-purification of streams, Streeter–Phelps equation, sewage disposal by irrigation, sewage farming, waste waters reuse.

Text/Reference books:

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

BCE 505 GEOTECHNOLOGY-I

3L+1T+0P+3.5C

MM: 100

Module 1

Fundamental Definitions & Relationship: Soil and soil mass constituents, Water content, specific gravity, void ratio, porosity, degree of saturation, air void and air content, unit weights, density index. Inter relationship of these terms.

Index Properties: Determination of index properties of soil, water content, specific gravity, particle size distribution, sieve and sedimentation analysis, consistency limits, void ratio and density index.

Module 2

Soil Classification: Classification of soil for general engineering purposes, particle size, textural H.R.B. Unified and I.S. Classification systems. Soil structure & soil map of India.

Clay mineralogy: Soil structure; single grained, honeycombed, flocculent, and dispersed, structure of composite soils, clay structure; basic structure, mineral structures, structures of Illite Montmorillonite and kaolinite and their characteristics. Soil water absorbed, capillary and free water.

Module 3

Permeability & Seepage: Soil water absorbed capillary and free water, Darcy's law of permeability of soil and its determination in laboratory: Field pumping out tests, factors affecting permeability, permeability of stratified soil masses. Seepage pressure, Laplace's equation for seepage. Flow net and its construction. Uplift pressure, piping, principle of drainage by Electro Osmosis, pheritic line.

Module 4

Stresses in Soil Mass: Total effective and neutral pressure, calculation of stresses. Influence of water table on effective stress, quicksand phenomenon.

Shear Strength of Soils: Mohr's circle of stress, shearing strength of soil, parameters of shear strength, Coulomb's failure envelope, determination of shear parameters by Direct Shear Box, Tri-axial and unconfined compression test apparatuses.

Module 5

Soil Compaction: Principles of soil compaction, laboratory compaction tests, Proctor's test, Modified Proctor tests, Measurement of field compaction, field methods of compaction and its control, dry and wet of optimum. Factors affecting of compaction.

Soil Stabilization: Soil stabilization, Mechanical Stabilization, Stabilization with cement, Lime and bitumen.

Text/Reference Books:

1. Basic and applied Civil Mechanics by Rajan & Rao, New Age International Publishers.
2. Soil Mechanics & Foundation Engineering by B.C.Punmia, Laxmi Publication.
3. Soil Mechanics & Foundation Engineering by Arora K.R, Standard Publishers and Distributers, Delhi.
4. Soil Engineering in Theory & Practice by Alam Singh, CBS Publishers and Distributers, Delhi.

BCE 506 PROJECT PLANNING AND MANAGEMENT

2L+0T+0P+2C

MM: 100

Module 1

FINANCIAL EVALUATION OF PROJECTS AND PROJECT PLANNING: Capital investment proposals, criteria to judge the worthwhileness of capital projects viz. net present value, benefit cost ratio, internal rate of return, Risk cost management, main causes of project failure.

Module 2

PROJECT SCHEDULING: Importance of project scheduling, project work breakdown process – determining activities involved, work breakdown structure, assessing activity duration, duration estimate procedure, Project work scheduling, Project management techniques – CPM and PERT networks analysis, concept of precedence network analysis.

Module 3

PROJECT COST AND TIME CONTROL: Monitoring the time progress and cost controlling measures in a construction project, Time cost trade-off process: direct and indirect project costs, cost slope.

Module 4

CONTRACT MANAGEMENT: Elements of tender operation, Types of tenders and contracts, Contract document, Legal aspects of contracts, Contract negotiation & award of work.

Module 5

SAFETY AND OTHER ASPECTS OF CONSTRUCTION MANAGEMENT: Causes and prevention of accidents at construction sites, Safety measures to be followed in various construction works like excavation, demolition of structures, explosive handling, hot bitumen work. Environmental and social aspects of various types of construction projects.

Text/Reference Books:

1. Construction Project Management by K.K. Chitkara, Tata McGraw Hills.
2. Project Management with CPM /PERT by B.C. Punmia, Laxmi Publication (P) Ltd.
3. Project Management by Modder & Phillph, CBS Publishers.

BCE 507 STRUCTURAL MECHANICS LAB-I

0L+0T+2P+1C

MM: 100

List of Experiments:

1. Study of friction, screw jacks, and winch crabs etc.
2. Deflection of a truss
3. Clark – Maxwell reciprocal theorem with truss
4. Funicular polygon for flexible cable
5. Deflection of redundant frame
6. Deflection of curved members
7. Buckling of columns
8. Clark – Maxwell reciprocal theorem with simply supported beam
9. Two hinged and three hinged arches.

BCE 508 GEOTECHNOLOGY LAB-I

0L+0T+2P+1C

MM: 100

List of Experiments:

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

B. Tech (Civil Engineering)

Semester-V

BCE 509 STEEL STRUCTURES DESIGN -I

0L+0T+2P+1C

MM: 100

Design as per syllabus of theory.

BCE 510 ENVIRONMENTAL ENGG. LAB – II

0L+0T+2P+1C

MM: 100

List of Experiments:

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

B. Tech (Civil Engineering)

Semester-V

BCE 511 CONCRETE STRUCTURE DESIGN -I

0L+0T+2P+1C

MM: 100

Design as per syllabus of theory

B. Tech (Civil Engineering)

Semester-V

BCE 512 DESIGN OF WATER AND WASTE WATER SYSTEMS

0L+0T+2P+1C

MM: 100

Design as per syllabus of theory

BCE 601 DESIGN OF STEEL STRUCTURES-II

3L+0T+0P+3C

MM: 100

Module 1

Design of gantry girder: Design of roof trusses including wind loading and purlin design, Introduction to Pre Engineered Buildings and tubular sections and their applications.

Module 2

Design of plate girder: Design of welded and bolted sections. Connections for flange plate to flange angles and flange angles to web, etc. Design of welded connections. Web and flange splicing. Horizontal, Intermediate and Bearing stiffeners. Curtailment of plates. Shear strength determination by post critical and tension field action methods. End panel design options and procedure as per IS 800.

Module 3

Bridges: Types of bridges, Loadings, Standard loading for railway bridges, Design of Deck type plate-girder bridges, design of its bracings and frames.

Module 4

Design aspects of foot over bridges. Design of through type truss girder bridges including stringer design, cross girder design, main truss members, portal and sway bracings etc.

Module 5

Water tanks, circular tanks with segmental bottoms, rectangular tanks, pressed steel tanks, design of staging.

Text/Reference Books:

1. Design of Steel Structures by N. Subramanian, Oxford University Press.
2. Limit state Design of Steel Structures: S K Duggal, TMH publication
3. Design of Steel Structures by S. Bhavikatti, I.K. International Pvt. Ltd.
4. Design of Steel Structures by V.L. Shah, Structures Publications.

BCE 602 IRRIGATION ENGINEERING

3L+0T+0P+3C

MM: 100

Module 1

Introduction: Definitions, functions and advantages of irrigation, present status of irrigation in India, classification for agriculture, soil moisture and crop water relations, Irrigation water quality. Consumptive use of water, principal Indian crop seasons and water requirements, multiple cropping, hybrid crops, water harvesting and conservation.

Module 2

Canal Irrigation: Types of canals, parts of canal irrigation system, channel alignment, assessment of water requirements, estimation of channel losses, design of channels, regime and semi theoretical approaches (Kennedy's Theory, Lacey's Theory), cross section of channels, silt control in canals.

Water Distribution System: Rotational delivery (Warabandi, Jama Bandi, Khasra Bandi, Sajra Sheets), continuous delivery and delivery on demand, Role of command area development authority, Functions and organizational structures.

Module 3

Distribution of Canal Water: System of regulation and control, outlets, assessment of canal revenue.

Hydraulics of Alluvial Rivers : Critical attractive force, regimes of flow, resistance relationship for natural streams, bed load, suspended load and total equations, different stages of rivers, meandering, aggradations, and degradation, river training & bank protection works.

Module 4

Water Logging: Causes, preventive and curative measures, drainage of irrigated lands, saline and alkaline lands, types of channels lining and design of lined channel.

Well Irrigation: Open wells and tube wells, types of tube wells, duty of tube well water.

Module 5

Hydrology: Definition, Hydrologic cycle, Application to Engineering problems, measurement of rainfall, rain gauge, peak flow, flood frequency method, catchment area formulae, Flood hydrograph, Rainfall analysis, Infiltration, Run off, Unit hydrograph and its determination, Estimation of runoff.

Text/Reference Books:

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

BCE 603 DESIGN OF CONCRETE STRUCTURES-II

3L+0T+0P+3C

MM: 100

Module 1

Elements of Pre-stressed Concrete: Principles and systems, material properties, losses of pre-stress, I.S. specifications, analysis and design of rectangular and T sections for flexure and shear.

Module 2

Torsion: Analysis and Design of beams for torsion as per codal method..

Continuous and Curved Beams: Analysis and Design of continuous beams using coefficients (IS Code), concept of moment redistribution. Analysis and design of beams curved in plan.

Module 3

Circular Domes: Analysis and design of Circular domes with U.D.L. & concentrated load at crown.

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

Module 4

Yield Line Theory: Introduction to Yield line concept, Application of Y.L.T. to slabs with simple support conditions.

Retaining walls: Analysis and design of Cantilever Retaining Walls: Introduction to counter fort and buttress type retaining walls, their structural behavior and stability analysis.

Module 5

Culverts and Bridges: Analysis and Design of super structure of slab culverts and T-bridge for I.R.C. loading.

Text/Reference Books:

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

BCE 604 GEOTECHNOLOGY-II

3L+1T+0P+3.5C

MM: 100

Module 1

Stresses in Soil under surface loading: Boussinesq's and Westergaard's analysis for vertical pressure and its distribution in a soil mass. Vertical stresses due to concentrated loads, Horizontal and shear stresses due to concentrated loads. Isobar diagram, Vertical stress distribution on a horizontal plane. Influence diagram. Vertical stresses at point under line load and strip load. Vertical stresses at a point under circular and rectangular loaded area. Approximate methods of obtaining vertical pressure due to surface loading.

Module 2

Compressibility and Consolidation: Introduction to consolidation, comparison of compaction and consolidation, Spring Analogy Terzaghi's one dimensional consolidation theory, Degree of consolidation, consolidation test, Compressibility parameters, co-efficient of consolidation. Pre consolidation pressure and its determination. Normally, over and under consolidated soils. Methods of predicting Settlement and its rate. Total and differential Settlement.

Module 3

Stability of Slopes: Classifications of slopes, Stability analysis of infinite slopes. Stability of finite slopes by Swedish and Friction circle method. Taylor's stability number curves. Stability of slopes of earthen embankments under sudden draw down, steady seepage and during construction. Bishop's method of stability analysis.

Module 4

Earth Pressure: Active, passive and earth pressure at rest. Rankine's and Coulomb's theories. Rebhann's and Culman's graphical methods for active earth pressure for vertical and inclined back retaining walls, horizontal and inclined cohesion less back fill. Stability analysis of retaining walls. Earth pressure on cantilever sheet piles, rigid bulk heads.

Module 5

Bearing Capacity of Soils: Terminology related to bearing capacity, Common types of foundations. Terzaghi and Meyehoff's theory for bearing capacity. Rankine's method for minimum depth of foundation. Skempton's method. Effect of eccentricity and water table on bearing capacity. IS code method, Plate load and penetration tests for determining bearing capacity.

Text/Reference Books:

1. Basic and applied Civil Mechanics by Rajan & Rao, New Age International Publishers.
2. Soil Mechanics & Foundation Engineering by B.C. Punmia, Laxmi Publication.
3. Soil Mechanics & Foundation Engineering by Arora K.R, Standard Publishers and Distributers, Delhi.
4. Soil Engineering in Theory & Practice by Alam Singh, CBS Publishers and Distributers, Delhi.

BCE 605 TRANSPORTATION ENGINEERING – I

3L+0T+0P+3C

MM: 100

Module 1

Introduction: Importance and Role of Transportation Systems, Technological and Operating Characteristics of Transportation Systems, Components of transportation Systems, Transportation Coordination, Transportation Modes and their comparison.

Highway Planning: Highway Planning Process, specifically in India, Transport or Highway related Agencies in India, Classification of Roads and Road Development Plans, Road Patterns, Controlling Factors and Surveys for Highway Alignment.

Module 2

Highway Materials and Construction: Desirable Properties, Testing Procedures, Standards and standard values relating to Soil, Stone Aggregates, Bitumen and Tar, fly-ash/pond-ash. Methods of constructing different types of roads viz. Earth roads, Stabilized roads, WBM roads, fly ash embankments, Bituminous roads and Concrete roads. Specific features of rural roads. Equipments for highway construction of rigid and flexible pavements.

Module 3

Highway Geometric Design: Cross Sectional Elements, camber, Sight Distances – definition and analysis of SSD and OSD, Design of Horizontal Alignment – Super elevation, extra widening, transition curves. Design of Vertical Alignment – Gradients, Vertical curves. Recommendations Indian Road congress code of Practice.

Module 4

Elementary Traffic Engineering: Significance of different Traffic Engineering Studies viz. Speed, Volume, O & D, Parking and Accident's Study. Importance and types of Traffic Signs, Signals, Road Markings and Road Intersections.

Module 5

Structural design of Highway Pavements: Design of Flexible Pavements by G. I. and CBR methods. Design of Rigid Pavements by Westergaard and modified methods. Design as guide lines of relevant Indian Road congress code of Practice. Failure & maintenance of highways.

Hill Roads: Special factors in Alignment and Geometric design, Drainage and maintenance of Hill roads. Road side Arboriculture and Landscaping. Recent Developments in Urban Roads and their role in economic developments.

Text/Reference Books:

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

BCE 612 HYDRO ELECTRIC POWER DEVELOPMENT

3L+1T+0P+3.5C

MM: 100

Module 1

Introduction:

Sources of power, estimation of water power, necessity and importance of harnessing small hydro power, flow duration and power duration curves, load curve, load factors, capacity factors, utilization factors, firm and secondary power.

Module 2

Types of Hydro Power Plants:

Elements of Hydro power, classification of hydro-power plants, run-of-river plants, storage plants diversion canal development, pumped storage plants, tidal power plants, base load and peak load plants in a power grid.

Module 3

Intakes:

Intake structures, functions and their types, components of intakes-forebay, trash racks, gates and valves, force required to operate gates.

Conveyance System:

Penstocks, design criterion, economical diameter anchor blocks, cradles and footings, water hammer, instantaneous closure of power canal, surge tank, surges in canals.

Module 4

Turbines:

Types of turbines, specific speed and classification of turbines, synchronous speed, scroll casing, flumes and draft tubes, dimensions of scroll casing and draft tubes, setting of turbines.

Module 5

Power House:

General layout and arrangements of hydro-power unit number and size of units, sub-structure, spacing of unit super-structure, underground power stations, tidal power.

Text/Reference Books:

1. Water Power Engineering, Dandekar, M.M., Sharma, K.N.
2. Hydro-Electric Engineering Practice Vol.-I & II & III Brown J.G.
3. Water Power Engineering, Borrows, H.K.
4. Water Power Development, Vol.-I & II, Mosonyi, E.
5. Water Power Engineering, M.M. Deshmukh.

BCE 613 RIVER MECHANICS & FLOOD CONTROL

3L+1T+0P+3.5C

MM: 100

Module 1

Introduction: Indian rivers, flood, flood problems, river morphology behavior of river flow, role of sediments in rivers, changes in regimes, river gauging, causes of flood and losses, alleviation of flooding. **Hydrologic Statistics:** Probabilistic treatment of hydrologic data, frequency & probability functions, statistical parameters, fitting a probability distribution, probability distribution for hydraulic variables.

Module 2

Flood Mitigation by River Protection: Basis of river engineering, flow types, resistance flow, energy slope, backwater effect, three dimensional flow, circular and helicoidal flow, river improvement works, river survey, protection by embankment, discharge capacity, design of dyke, stability analysis of dykes, bank protection, bank recession, types of bank protection works, channel improvement, cutoffs diversion, bypass channel, cutoff channel, flooded ways, flood plain zeroing, spreading grounds.

Module 3

Flood Mitigation by Reservoirs: Design factors, storage capacity determinations, sequent peak algorithm method, live storage, ripple mass curve flood routing, flood storage, dead storage, reservoir classification, reservoir sedimentation, distribution of sediment load measurement, Mood's method, life of reservoir, reservoir operation based on annual storage and regulation, single and multipurpose reservoirs, gate operation schedule, maximum and minimum flow operation, multipurpose reservoir operation, reservoir economics-cost benefit ratios, optimization of benefits.

Module 4

Flood Forecasting & Warning: Basic data, communication network, forecasting techniques and procedures, forecast of rainfall, runoff from rainfall, forecasting stages, peak travel time, forecast reporting, flood warning, Engineering methods for flood fighting.

Module 5

Engineering Economics of Flood Control: Estimation of flood damages, estimation of benefits of flood control, cost benefit analysis of flood control project.

Text/Reference Books:

1. Flood Control & Drainage Engg. By S.N. Ghosh
2. Hydrology & Flood control Engg. By S.K.Garg
3. Hydrology & Water Resources Engg. By K.C. Patra

BCE 614 BRIDGE ENGINEERING

3L+1T+0P+3.5C

MM: 100

Module 1

Introduction: Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigation and essential design data.

Module 2

Standard Specifications for Roads and Railways Bridges: General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.

Module 3

Design Consideration for R.C.C. Bridge: Various types of R.C.C. bridges (brief description of each type), design of R.C.C. culvert and T-beam bridges.

Module 4

Design Consideration for Steel Bridges: Various types of steel bridges (brief description of each), design of truss and plate girder bridges.

Module 5

Hydraulic & Structural Design: Piers, abutments, wing-wall and approaches.

Brief Description: Bearings, joints, articulation and other details.

Bridge Foundation: Various types, necessary investigations and design criteria of well foundation.

Text/Reference Books:

1. Essentials of Bridge Engineering, by D.J. Victor, Oxford & IBH Pub., N.Delhi.
2. Design of Bridges, by N.Krishna Raju, Oxford & IBH, N.Delhi.
3. Bridge Deck Analysis, by R.P.Pama & A.R. Cusens, John Wiley & Sons.
4. Design of Bridge Structures, by T.R. Jagadish & M.A. Jairam, Prentice Hall of India, N.Delhi.

BCE 615 ROCK MECHANICS

3L+1T+0P+3.5C

MM: 100

Module 1

Engineering Classification of Rocks: Objectives, Intact rock classification, Rock mass Classification. Terzaghi's, Rock load classification, Austrian classification, Deere's rock quality classification, rock structure rating concept, RMR classification, Q classification. Inter relation between Q and RMR, prediction of ground condition and support pressure. Effect of Tunnel size on support pressure.

Module 2

Engineering Properties and Laboratory Tests on Rocks: Porosity, Density, Moisture content, Degree of saturation, Co-efficient of permeability, Durability, Compressive strength, Tensile strength, Shear strength, elasticity, Plasticity Deformability. Sampling and Samples Preparations, Uniaxial Compressive strength, Tensile Strength – Brazilian test, Shear strength test – Direct Shear test and Punch shear test, Triaxial Test, Flexural strength.

Module 3

In situ Tests on Rocks: Necessity of In situ test, Plate load test for deformability, Shear test, Test for internal stresses – flat Jack, pressure meter test. **Jointed Rocks:** Rocks Joint properties, Joint properties, Joint Roughness Co-efficient, Scale effects, Dilation, Orientation of Joints, Gouge, Joint Intensity, Uniaxial Compressive strength of Jointed Rocks.

Module 4

Strength of Rocks in Unconfined Condition: Ramamurthy Strength Criteria, Singh and Rao Strength Criteria, Kulatilake Methodology, Hoek Criteria, Barton Methodology. **Strength of Rocks in Confined Condition:** History of Hoek and Brown Failure Criteria and latest methodology, Parabolic Strength Criteria.

Module 5

Grouting and Rock Bolting: Grouting materials, Grouting operations, methods of Grouting, Mechanism of Rock Bolting, Principal of design. **Bearing Capacity of Rocks:** Bearing capacity of intact rocks, jointed rocks, IS Code methodology, Singh and Rao Method and latest methodologies.

Text/Reference Books:

1. Rock Engg. For Engineers by B.P. Verma , Khanna Publishers.
2. Rock Engg. By Bhawani Singh, Elsevier Science Ltd.
3. Foundation on Rocks by Duncan C.Wyllie, Spon Press.
4. Engineering in Rock for Slopes, Foundation and Tunnels, by Ramamurthy, PHI Delhi.
5. IS Codes on Rocks

BCE 616 SOLID WASTE MANAGEMENT

3L+1T+0P+3.5C

MM: 100

Module 1

General: Problems associated with Solid Waste Disposal.

Generation of Solid Waste: Goals and objectives of solid waste management, Classification of Solid Waste. Solid Waste Generation, Factors Influencing Generation of Solid Waste, Characteristics of Solid Waste, Analysis of Solid Waste.

Module 2

Onsite Handling, Storage and Processing: Public Health and Aesthetics, Onsite Handling, Onsite, Storage, Dust bins, Community Containers, Container Locations, On-site Processing Methods.

Module 3

Solid Waste Collections, Transfer and Transport: Collection Systems, Equipment and Labor requirement, Collection Routes, Options for Transfer and Transport Systems.

Module 4

Processing and Disposal Methods: Processing Techniques and Methods of Disposal, Sanitary land filling, Composting and Incineration, Bioremediation.

Module 5

Recovery of Resources, Conversion, Products and Energy: Material Recovery, Energy Generation and Recovery Operation, Reuse in other industry.

Industrial Solid Waste: Nature, Treatment and Disposal Methods.

Text/Reference Books:

1. Solid Waste Engineering Principles and Management Issues by G. Technobanogious H. Theisen & R. Blssen, Mc Graw Hill Book Co.
2. Solid Waste Management by C.L. Mantell, Mc Graw Hill Book Co.
3. Solid Waste Management in Developing Countries by Bhide & Sunrashen PHI.
4. 'Municipal solid waste management manual' Central Public Health and Environmental Engineering Organisation (CPHEEO) 2015.

BCE 606 ROAD MATERIAL TESTING LAB

0L+0T+2P+1C

MM: 100

List of experiments:-

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

BCE 607 GEOTECHNOLOGY LAB-II

0L+0T+2P+1C

MM: 100

List of experiments:-

1. To determine the differential free swell index of soil.
2. To determine the compressibility parameters of soil by consolidation test.
3. To determine the swelling pressure of soil.
4. To determine the shear strength parameters of soil by tri-axial test.
5. To determine the permeability of soil by constant and falling head methods.
6. To determine the CBR of soil.
7. To determine the grain size distribution of fine grained soil by Hydrometer.
8. To determine shear strength of soil by direct shear test.
9. Determination of unconfined compressive strength by unconfined compression Test Apparatus.

B. Tech (Civil Engineering)

Semester-VI

BCE 608 STEEL STRUCTURES DESIGN -II

0L+0T+2P+1C

MM: 100

List of experiments:-

Design Problems as per different units of syllabus of theory.

B. Tech (Civil Engineering)

Semester-VI

BCE 609 CONCRETE STRUCTURES DESIGN -II

0L+0T+2P+1C

MM: 100

List of experiments:-

Design Problems as per different units of syllabus of theory.

BCE 610 STAAD Pro

0L+0T+2P+1C

MM: 100

S.No.	Topics
1	Overview of Structural Analysis and Design, Calculating Shear Force and Bending Moment values for various supports and load types, Introduction STAAD.Pro V8i, Co-ordinate Systems Global Vs. Local, Creating a New Project in STAAD.Pro, Units, Model Generation, Creating Nodes & Members, Select Menu
2	Add Beam, Point to Point, Between Midpoints, Perpendicular Intersection, Curved Member Practice
3	Model Editing Tools, Translational Repeat, Circular Repeat, Move, Mirror, Rotate, Insert Node , For a Single Member, For Multiple Members
4	Model Editing Tools, Connect Beams Along, Stretch Selected Members, Intersect Selected Members, Merge Selected Members, Renumber, Split Beam, Break Beams at Selected Nodes, Creating Models by using Structure Wizard, Mini Project 1
5	Loading , Creating a Primary Load, Adding Self weight Loading, Nodal Load, Member Load , Uniform Force and Moment, Concentrated Force and Moment Linear Varying Load, Trapezoidal Load, Hydrostatic Load, Pre/Post Stress, Area Load, Floor Load, Mini Project 2
6	Loading , Wind Load, Creating Load Combination, Automatic Load Combination, Moving Load, Practice, Mini Project 3
7	Introduction to Analysis, Perform Analysis, Overview of Output Page, Pre-analysis Print, Post-analysis Print, Practice
8	General Guidelines for Design, Concrete Design in STAAD.Pro , Column Design, Beam Design,
9	RC Designer , Beam Design, Column Design, Major Project 1
10	Seismology, Introduction, Terminologies, Standards for Earthquake Design, General Principals for Earthquake Design, Finding the Lateral Force (manual calculation), Finding the Lateral Force by using STAAD.Pro
11	Dynamic Analysis, Response Spectrum Analysis, Mini Project 4
12	Introduction to FEM, FEM Modelling in STAAD.Pro , Snap Plate, Add Plate, Create Infill Plate, Generate Plate Mesh, Parametric Modelling
13	Creating FEM models by using Structure Wizard, Adding Plate Thickness, Plate Load Pressure on Full Plate, Concentrated Load, Partial Plate Pressure Load, Trapezoidal Load, Hydrostatic Load, Element Joint Load
14	Slab Design Staircase Design, One-way Slab, Two-way Slab, Mini Project 5
15	Water Tank Design, Shear wall Modelling and Design, Mini Project 6
16	Steel Design in STAAD.Pro Using Steel Member Table, Interactive Steel Design, Design of Overhead Transmission Line Towers, Major Project 2
17	Foundation Design, Isolated Footing, Combined / Strip Footing, Tool Kit, Isolated Footing, Combined Footing
18	Foundation Design, Mat Foundation, Pile Cap Design, Mini Project 7
19	Importing CAD Models, Report Setup, Plotting from STAAD.Pro, Final Project

BCE 701 WATER RESOURCES & SYSTEMS ENGINEERING

3L+1T+0P+3.5C

MM: 100

Module 1

Regulation of works: Falls, Classification of falls, Design of falls, Distributory head regulator and crosshead regulator, Escape, bed bars.

Cross-Drainage Structure: Necessity of Cross-drainage structures, their types and selection, comparative merits and demerits, design of various types of cross-drainage structure-aqueducts, siphon aqueduct, super passage siphon, level crossing and other types.

Module 2

Diversion Head works: Design for surface and subsurface flows, Bligh's and Khosla's methods. Selection of site and layout, different parts of diversion head works, types of weirs and barrages, design of weirs on permeable foundation, silt excluders and different types of silt ejectors. Energy dissipation.

Module 3

Embankment Dams: Suitable sites, causes of failures, stability and seepage analysis, flow net, slope stability analysis, precautions of piping, principles of design of earth dams.

Gravity Dams: Force acting on a gravity dam, stability requirements, Instrumentation.

Module 4

Spillways: Spillway capacity, flood routing through spillways, different types of spillways and gates, energy dissipation below spillways.

Hydro Power Plant: General features of hydroelectric schemes, elements of power house structure, selection of turbines, draft tube and setting of turbine, cavitations.

Module 5

Reservoirs: Evaluation of impact of water projects on river regimes and environment. Reservoir Sedimentation and water shed management.

Text/Reference Books:

1. Irrigation Water Power and Water Resource Engineering By KR Arora, Standard Publishers and Distributors, Delhi.
2. Water Resources Engineering by Modi, Standard Publishers.
3. Theory and Design of Irrigation Structures by Varshney Gupta and Gupta, Nem Chand & Brothers, Roorkee.
4. Fundamentals of Irrigation Engineering by Bharat Singh, Nem Chand Brothers, Roorkee.

BCE 702 TRANSPORTATION ENGG.-II

3L+0T+0P+3C

MM: 100

Module 1

Introduction and Permanent Way Components: Types and Selection of Gauges, Selection of Alignment, Ideal Permanent Ways and Cross-sections in different conditions, Drainage, Salient Features and types of Components viz. Rails, Sleepers, Ballast, Rail Fastenings.

Study of Specific Aspects: Coning of Wheels, Creep, Wear, failures in Rails, Rail Joints, Length of Rail, Sleeper Density and Spacing, Stations, Yards and Sidings, Turn-Table, Signaling.

Module 2

Points and Crossings: Types of Turnouts, Points or Switches, layout Plans of different types of Crossings, Design calculations of turnouts.

Railway Systems Specific to Urban Movements: Surface railways (sub urban railway system of Mumbai, Chennai and Delhi), Underground system (Metro of Kolkata/ Delhi), Elevated Systems (as Proposed for Jaipur, Delhi, Mumbai), Light Rail System (MRTS, Thane). Recent Developments in Railway Networking.

Module 3

Geometric Design: Gradient and Grade Compensation, Super elevation and cant, cant deficiency, Types of Curves, Transition curves, their designs, Widening of Gauges.

Module 4

Airport Engineering:-Introduction: Requirements to Airport Planning, Airport Classifications, Factors in Airport Site Selection, Airport Size, Obstructions, Zoning.

Planning and Design of Airport: Requirements of Airport, Planning of Terminal Area, and different Layouts, Location of Gates, Types of Runway patterns, Runway Layout, Runway Length, Geometric Design of Runways, Layout of Taxiways, Geometric Standards, Exit or Turnaround Taxiways, Apron and Hangers.

Module 5

Airport Pavement Design: Factors Affecting Pavement Design, Design methods of Flexible Pavements, Design methods of Rigid Pavements.

Text/Reference Books:

1. Transportation Engineering by A.K. Upadhyay, S.K.Kataria and Sons.
2. Airport Engineering by Rangwala,Charotar Publishing House.
3. Railway Engineering by Sexena S.C. and Arora S.P, Dahnpat Rai Publishers, Delhi.
4. Railway Engineering by Satish Chandra and M.M Agarwal, Oxford University Press, Delhi.

BCE 714 MACHINE FOUNDATIONS

3L+1T+0P+3.5C

MM: 100

Module 1

Theory of Vibrations:

Definitions, harmonic motion, vibrations of a single degree freedom system, transmissibility, theory of vibration measuring instruments.

Module 2

General Principles of Machine Foundation Design:

Types of machines and machine foundations, criteria for satisfactory action of a machine foundation, permissible amplitude, allowable soil pressure, permissible stresses in concrete and steel, permissible stresses in timber.

Module 3

Evaluation of Parameters: Modes of vibration of a rigid block foundation, Barken's soil spring constants, determination of coefficients of elastic uniform compression and Elastic uniform shear.

Foundations for Reciprocating Machines: Analysis of block foundation by Barken's theory of linear elastic weightless spring analogy, Indian Standard for design and construction of foundation for reciprocating machine, design procedure, design examples.

Module 4

Foundation for Impact Machines: Dynamic analysis, Barken's recommendations for weight and base contact area, IS Code practice for design and construction of foundations for impact machines, design procedure, design examples.

Foundations for Rotary Machines: Special considerations, design criteria, methods of analysis and design.

Module 5

Vibration Isolation and Screening: Active isolation, passive isolation, methods of isolation, wave screening, vibration absorbing materials, planning for vibration isolation.

Text/Reference Books:

1. Dynamics of Bases and Foundations by D.D.Barken
2. Soil Dynamics by Shamsheer Prakash
3. Soil Dynamics and Machine Foundations by Swami Saran
4. Principles of Soil Dynamics by B.M. Das
5. Vibration and Shock Isolation by Crede.

BCE 715 ADVANCED COMPOSITE MATERIALS FOR STRUCTURES

3L+1T+0P+3.5C

MM: 100

Module 1

Overview: Advanced Composite Materials Polymer Matrix Composite Constituents, Polymers, High-performance Fibers, Manufacturing Processes, Prepreg based Processes, Non-prepreg based Processes, Tooling

Module 2

Preliminary Discussion/Review: Review: Force, Stress, and Strain Tensors, Hooke's Law for Anisotropic Materials

Module 3

Introduction to Composite Stress Analysis: Unidirectional Composite Laminates, Multi-angle Composite Laminates

Module 4

Classical Lamination Theory: Simplifications Due to Stacking Sequences, Effective Material Properties, Program CL, Composite Strength Predictions

Module 5

Brief Comments (notched behavior, LEFM, transverse displacements/buckling), Non-destructive Inspection and Composite Repair Techniques

Text/Reference Books:

1. Structural Analysis Of Polymeric Composite Materials (2004), Prof. Mark E. Tuttle, University of Washington
2. Advanced mechanics of composite materials, Valery V. Vasiliev, Elsevier Science & Technology Books, 2007

BCE 716 RENEWABLE SOURCE OF ENERGY

3L+1T+0P+3.5C

MM: 100

Module 1

Solar Energy: Primary energy sources, direct energy conversion, comparison with conventional energy, conversion devices. Solar energy – Principles of solar energy collection, solar radiation, measurements, instruments, data and estimation, type of collectors, characteristics and design principles of different types of collectors, testing of collectors.

Module 2

Application of Solar Energy: Solar thermal applications - water heaters and air heaters performance and applications – simple calculations – solar cooling, solar drying, solar ponds, solar tower concepts, solar furnace.

Module 3

Wind and Tidal Energy: Energy from the wind - general theory of wind mills - design aspects of horizontal axis and vertical axis wind mills, applications - Energy from tides and waves - working principles of tidal plants and ocean thermal energy conversion plants - power from geothermal energy - principle of working of geothermal power plants.

Module 4

Energy from Waste

Energy from bio-mass, bio-gas plants - various types - design principles of bio-gas plant applications- Energy from wastes – wastes burning power plants - utilization of industrial and municipal wastes - energy from the agriculture wastes.

Module 5

Energy Conversion Systems and Applications: (Description, Principles of working and basic design aspects only) – Magneto hydrodynamic systems- thermo – electric generators, thermionic generators - fuel cells, solar cells, types, EMF generated, power output - losses and efficiency and applications.

Text/Reference Books:

1. GD Rai, Non Conventional Energy Sources, Khanna Publishers.
2. Bent Sorensen, Renewable energy, third edition, Elsevier academic press.
3. Rao & Punlekar, Unconventional Energy Systems, Khanna Publishers.

BCE 717 ELEMENTS OF EARTHQUAKE ENGINEERING

3L+1T+0P+3.5C

MM: 100

Module: 1

Elements of Earthquake origin & Propagation Elements of Seismology - Earthquakes - Structure of the Earth -History of the Earth -Earthquake Mechanism - Propagation of Seismic Waves -Earthquake Phenomena -Earthquake Measurements -Definitions of magnitude, intensity, epicenter etc; Plate tectonics, seismographs, liquefaction, Types, effects and controlling factors .

Module: 2

Theory of Vibration Effects: Dynamic Loads: D'Alembert's Principle and inertia forces- Stiffness and flexibility of elastic structures -Theory of Vibrations - Free vibrations of single and multiple degree freedom systems -computations of dynamic response to time dependent forces-mass and stiffness matrices - natural frequencies - Plate Tectonics Theory.

Module: 3

Earthquake Resistant Design: Principles of Earthquake Resistant Design - Response spectrum theory. Time – Acceleration method Application of response spectrum theory to seismic design of structures.

Module: 4

Earthquake Damages: Earthquake Damages to Various Civil Engineering Structures - Case Histories Earthquake-Earthquake response of structures – Soft storey collapse – Slender structures, unsymmetrical structures

Module: 5

Methods of disaster prevention: Earthquake resistant building Regulations – specification – guidelines for construction – Materials selection.

Text/Reference Books:

1. A K. Chopra, Dynamics of Structures – Theory and Applications to Earthquake Engineering, Second Edition, Printice-Hall India Pvt Ltd.
2. Pauley & Priestly, Seismic design of reinforced concrete and masonry buildings, John Wiley & Sons.
3. Stratta. J.L, Manual of Seismic Design, Prentice-Hall India Pvt Ltd.
4. Kramer. S.L., Geotechnical Earthquake Engineering, Prentice-Hall India Pvt Ltd.
5. Agarwal & Shrinkhardo, Earthquake Resistant design of a structures, Prentice-Hall India.

BCE 718 TRANSPORT PLANNING

3L+1T+0P+3.5C

MM: 100

Module 1

Transport Planning Process: Scope – interdependence of land use and traffic – systems approach to transport planning – survey of existing conditions and forecasting future conditions. Transport survey – definition of study area – zoning survey – types and methods – inventory on transport facilities – inventory of land use and economic activities.

Module 2

Trip Generation: Factors governing trip generation and attraction rates – multiple linear regression analysis – category analysis – critical appraisal of techniques.

Module 3

Distribution Methods: Uniform factor method, average factor methods – gravity model and its calibration – opportunity model.

Module 4

Trip Assignment and Modal Split: Traffic assignment – general principles – assignment techniques – all nothing assignment – multiple root assignment – capacity – restraint assignment – diversion curves Modal split – advantages and limitations.

Module 5

Evaluation Techniques: Economic evaluation techniques – performance evaluation – rating and ranking methods – case studies in evaluation – rating and ranking methods – case studies in evaluation of transport projects – land use transport models – transport planning for medium and small sized towns.

Text/Reference Books:

1. L.R. Kadiyali, Traffic Engineering and Transport planning, Khanna Publishers, New Delhi.
2. Paul. H. Wright, Transportation Engineering – Planning & Design, John Wiley & Sons, New York.
3. John W Dickey, Metropolitan Transportation Planning, Tata McGraw-Hill publishing company Ltd, New Delhi.

BCE 719 FUNDAMENTALS OF ENERGY AND CLIMATE CHANGE

3L+1T+0P+3.5C

MM: 100

Module 1

Overview: Overview on the Earth's energy requirement vis-à-vis Climate Change. Origins of the terrestrial atmosphere. Earth's early atmosphere. Introduction to Climate. Layers of the atmosphere. Composition of the present day atmosphere. Post Industrial Revolution Scenario.

Module 2

Energy Balance

Energy Balance: Earth –Atmosphere System. Solar and Terrestrial Radiation. Absorption of Radiation by gases. Energy balance. Solar variability and the Earth's Energy Balance –Basic concepts only.

Module 3

Atmospheric Chemistry and Climate

Atmospheric Chemistry and Climate: The Global Temperature Record. Green House Gas theory. Possible effects of Global Warming – Indian Context. The Ozone depletion problem. Atmospheric Aerosol and Cloud Effects on Climate.

Module 4

Environmental Variability

Environmental Variability: Natural and Anthropogenic. Effects of urbanization, Landscape changes, Influence of Irrigation, Desertification and Deforestation.

Module 5

Safeguarding Future Climate

Safeguarding Future Climate. The role of International Bodies. Kyoto and Montreal Protocol. Intergovernmental Panel on Climate Change (IPCC 2007). The Stern Report. Carbon Credits. Indian Context .Alternative. Predicting Future Climate Change : Global Climate Models.

Text/Reference Books:

1. Climate and Energy Systems. A review of their interactions. Jill Jaeger. John Wiley.
2. Policy interventions to promote energy efficient and environmentally sound technologies in SMI. Asian Institute of Technology.
3. Human Impacts on Weather and Climate. W.R. Cotton and R.A. Pielke. Cambridge University Press.
4. Introduction to Boundary Layer Meteorology. B. Stull. John Wiley.
5. Plus, Journal Articles from J. Geophys. Res., Climate Change, Geophysical Res. Letts. Etc.

BCE 720 SITE ORGANIZATION AND MANAGEMENT

3L+1T+0P+3.5C

MM: 100

Module 1

Preparation of Site: Site Clearance, Layout, infra-structural facilities, organizing utilities, site grading legal frame-work, liaison with local authorities, acquisition of land Various levels, job description, role of consultants, contractor and client and their responsibilities, training, Job layout, placement of material equipment on site.

Module 2

Documentation, inspection, Machinery, stores equipment, contractor, Quarries, vendors. Introduction to Risk assessment and management, Health and safety legislation and regulations and, Safety management systems.

Module 3

Supervision: Procedure for quality assurance, Controlling and reporting system, Labour laws, legislation.

Module 4

Safety Management: Safety management function, line versus staff authority, safety responsibility and accountability in construction industry. Safety and its importance in construction industry, hazards in construction projects, causes of accidents, cost of an accident.

Module 5

Experience Modification Rating, Workers insurance, general safety programs in construction industry, construction safety problems, Systems safety analysis, faulty tree analysis, failure modes and effects analysis in construction industry.

Text/Reference Books:

1. B. Sengupta and H. Guha; Construction Management and Planning, Tata McGraw Hill.
2. R.L. Peurifoy, W.B. Ledbetter and C.J. Schexnayder, Construction planning and methods, McGraw Hill International edition.
3. P.K. Joy; Total Project Management – The Indian Context, McMillan India Ltd.
4. P.K. Joy; Hand Book for Construction Management, MacMillan India Ltd.
5. Hand Book on Labour Contract Legislation, ILO

BCE 721 ADVANCED TRAFFIC ENGINEERING

3L+1T+0P+3.5C

MM: 100

Module 1

Traffic studies : Road user and Vehicle Characteristics - Traffic Studies -Traffic volume and composition - speed, Headway - Concentration and Delay & Flow principles - Capacity and level of service.

Module 2

Traffic Facilities Signals - Islands - Types and General layout of at-grade and grade separated intersections.

Module 3

Traffic Regulations and Management: Traffic signs and markings - Parking practices - Traffic management measures.

Module 4

General Principles and Flexible Pavement Design: Factors affecting pavements stability – equivalent single wheel load – vehicle, soil, traffic & Climatic factors - stress distribution in different conditions - CBR method of design - AASSO method & Burmister design method

Module 5

Rigid Pavement Design: Stresses in concrete pavement – IRC method – design of steel reinforcements – Function of joints, design of joints in concrete pavements - Joint Fillers and sealant.

Text/Reference Books:

1. Kadiyali.L.R, Traffic Engineering and Transportation Planning, Khanna Publishers.
2. S.K. Sharma, Principles, Practice and design of highway Engineering, S. Chand & Co Ltd, New Delhi.
3. S.K. Khanna & E.G. Justo, Highway Engineering, Nemchand Brothers, Roorkee.
4. ratab Chraborthy & Animesh Das, Principles of Transportation Engineering, Tata McGraw Hill Co.

BCE 722 GROUND WATER HYDROLOGY

3L+1T+0P+3.5C

MM: 100

Module 1

Occurrence and Movement of Groundwater Introduction to Hydrologic cycle – Origin and Age of groundwater, classification of groundwater, aquifer - water table - Darcy's Law, Coefficient of Transmissibility and storage - Flow rates and equation.

Module 2

Well Hydraulics Geophysical methods, study of radial flow - well flow, Multiple well system - characteristic well losses, open well, tube well, well depth, well screen - head losses through the screen gravel packing and formation stabilisation.

Module 3

Analysis and Evaluation of Pumping Test Definition of terms - static water level, pumping level, drawdown – residual, drawdown pumping rate - automatic water level recorder - time drawdown analysis - distance drawdown analysis, Jacob's methods, pumping test methods.

Module 4

Pollution of Groundwater Measures of water quality- chemical analysis - graphical representation, physical analysis, biological analysis - Pollution in relation to water use - sources, municipal, industrial, agricultural, evaluation of pollution potential. – Saline Water intrusion in coastal aquifers.

Module 5

Groundwater Modeling and Management Groundwater flow Modelling – Porous media models – Analog models – Electric analog models – Digital computer models – Basin Management – Hydrological Equilibrium equation – Salinity balance – Conjunctive use of surface and groundwater resources.

Text/Reference Books:

1. David Keith Todd, Groundwater Hydrology, Second Edition, John Wiley & Sons Singapore.
2. Raghunath H.M., Groundwater, Second Edition, Wiley Eastern Limited, New Delhi.
3. Abdel-Aziz ismail kashef , Groundwater Engineering, McGraw-Hill International Editions, Newyork.

BCE 723 DESIGN OF HYDRAULIC STRUCTURES

3L+1T+0P+3.5C

MM: 100

Module 1

Gravity Dams: Dam parameters, Criteria for selection of dam sites, Joints & keys, Cooling arrangement, Water stops at joints, Closing gaps, forces acting on dams, Types of loads, Elementary profile of a gravity dam, Step by step method, Stability analysis methods, Safety criteria, Gravity analysis, Internal stress calculations, Graphical determination of shear stress, Effect of foundation elasticity on stresses, Galleries, Behavior of concrete gravity dam subjected to earthquakes, Thermal stresses.

Module 2

Arch Dams: Development of arch dam, Valleys suited for arch dams, Arch dams layout, Types of arch dams, Appurtenant works, Thin cylinder theory and most economical central angle, Design of arch dam, Suitability at abutments, Effects of foundation elasticity on the behaviors of arch dam.

Module 3

Buttress Dams: Types of buttress dam, Selection of type of buttress dam, Most economical profile having no tension, Design principles, Buttress design by Unit column theory, Basic shape of buttress, Design of multiple arch dam, Provision of spillways and outlet works.

Module 4

Spillways and Energy Dissipaters: Factors affecting design, Components of spillways, Types of spillways, Design principles. Hydraulic design ogee spillway, Side channel spillway, Chute spillway, Syphon spillway, Shaft spillway, Energy dissipation below spillways, Bucket type energy dissipaters, Design of various types of stilling basins.

Module 5

Weirs and Barrages: Design of weirs & barrages on permeable foundation, Khosla theory of independent variable, Upstream and downstream protection, Flow nets, design of sloping Glacis weir, calculation for hydraulic jump and uplift pressure.

Text/Reference Books:

1. Engineering for Dams by Creager, Justin & Hinds, Wiley Eastern Pvt. Ltd. Delhi.
2. Concrete dams by R. S. Varshney, Oxford & IBH Pub. Co. Delhi.
3. Dams Part-1 gravity Dams by K. B. Khushalani, Oxford & IBH, Delhi.
4. Design of weirs on permeable foundations, CBIP Pub. No.20, Delhi.
5. Hydraulic Design of spillways, ASCE technical Engg. No.2, Design Guides as adapted from theUSArmy Corps.

BCE 724 REPAIR & REHABILITATION OF STRUCTURE

3L+1T+0P+3.5C

MM: 100

Module 1

Deterioration of concrete in structures: physical processes of deterioration like F & T abrasion, erosion, pitting, chemical processes like carbonation, chloride ingress, corrosion, alkali aggregate reaction, sulphate attack; their causes, mechanism, effect, preventive measures.

Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures etc.

Module 2

N.D.T.: Non destructive test methods for concrete including rebound hammer, ultrasonic pulse velocity, rebar locator, corrosion meter, penetration resistance and pull out test, core cutting etc.

Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

Module 3

Materials for repair: polymers and resins, self curing compound, FRP, Ferro cement etc; properties, selection criterion, bonding aspect.

Module 4

Repair Techniques: grouting, jacketing, shotcrete, externally bonded plates and under water repair; materials, equipments, precautions process etc.

Module 5

Investigation for structures: Distress, observation and preliminary test methods. **Case studies:** related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion damaged structures.

Text/Reference Books:

1. Properties of Concrete by A.M. Neville, Pearson.
2. Concrete Technology by M.S. Shetty, S.Cahnd & Comp.
3. Hand book of Analytical Techniques in Concrete Tech by V.S.. Ram Chandran, Standard Publishers.
4. Repair And Rehabilitation Of Concrete Structures by Modi, Poonam I. and Chirag N., PHI Learning Pvt. Ltd

BCE 725 ENVIRONMENTAL IMPACT ASSESSMENT

3L+1T+0P+3.5C

MM: 100

Module 1

Overview: Impact of development on environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – Historical development – EIA capability and limitations – Legal provisions on EIA.

Module 2

EIA Methods: Methods of EIA – Strengths, weaknesses and applicability – Appropriate methodology – Case studies.

Module 3

EIA Procedures: Socio Economic Impact – Assessment of Impact on land, water and air, energy impact; Impact on flora and fauna; Mathematical models; public participation – Reports – Exchange of Information – Post Audit – Rapid and comprehensive EIA.

Module 4

Quantitative Methods: Use the mathematical models in EIA – Water quality, air quality and noise; assumptions and limitations. Basic tenets of Global Climate Models

Module 5

Infrastructure Development Projects and Impacts: Case studies – highway, airport, dams, power plans, etc, Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the project affected people, climate impacts and EIA.

Text/Reference Books:

1. Anjaneyalu, Y., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad. Canter R.L., Environmental Impact Assessment, McGraw Hill Inc., New Delhi.
2. Environmental Assessment Source book, Vol. I, II & III., the World Bank, Washington, D.C.
3. Judith Petts, Hand book of Environmental Impact Assessment, Vol. I & II, Blackwell Science.

BCE 726 DESIGN OF MULTI STORY STRUCTURES

3L+1T+0P+3.5C

MM: 100

Module 1

Behavior of Tall Structural Systems: Behavior under gravity and lateral loads- moment resistant frames-shear walls, wall frame systems- portal and cantilever methods of analysis – design of shear walls- analysis of wall frame systems using charts

Module 2

Flat-Slabs: Design of flat slab type of construction- direct design method as per BIS code - Design of edge beams- design of columns- use of design aids (SP16)

Module 3

RCC Water Tanks: Design of water tanks – underground sumps- with water table- overhead circular, rectangular, Intze type tanks – staging- column- brace type and shaft type- design of circular raft foundation.

Module 4

Retaining Walls: Design of cantilever and counter fort retaining walls in basements- surcharge water pressure

Module 5

Detailing For Ductility: Requirement of ductility in multistoried structures- ductile detailing of beams, columns, foundation – design of transverse reinforcement in columns and shear stirrups in beams- confining reinforcement

Text/Reference Books:

1. Smith .B.S, Alex Coull, “Tall Building Structures, Analysis and Design”, John Wily & Sons. Inc., USA.
2. Varghese .P.C, “Advanced Reinforced Concrete Design”, Pretince-Hall India.
3. Unnikrishna Pillai .S and Devadas Menon, “Reinforced Concrete Design”, Tata McGraw Hill Publishing Company Limited, New Delhi.
4. Krishnaraju .R, Pranesh .R.N, “Design of Reinforced concrete” IS : 456- 2000, New age International Publication (P) Ltd., New Delhi.
5. Punmia .B.C, Ashok Kumar Jain, Arun Kumar Jain, “Limit State Design of Reinforced Concrete”, Laxmi Publications, New Delhi.
6. IS456:, “Code of Practice for Plain and Reinforced Concrete”, BIS, New Delhi.
7. “Design Aids for Reinforced Concrete to” IS 456, Special Publication (SP16), BIS New Delhi, 1980.
8. IS13920:1993, “Ductile Detailing Of Reinforced Concrete Structures Subjected To Seismic Forces - Code Of Practice”, BIS New Delhi.

BCE 727 INTRODUCTION TO FINITE ELEMENT METHOD

3L+1T+0P+3.5C

MM: 100

Module 1

Introduction: the finite element method - the element characteristic matrix - element assembly and solution for unknowns - summary of finite element history - basic equations of elasticity – strain displacement relations - theory of stress and deformation - stress-strain-temperature relations.

The direct stiffness method: structure stiffness equations - properties of [K] - solution of unknowns - element stiffness equations - assembly of elements - node numbering to exploit matrix sparsity - displacement boundary conditions - gauss elimination solution of equations - conservation of computer storage - computational efficiency - stress computation - support reactions - summary of the finite element procedure

Module 2

Stationary principles, Rayleigh-Ritz and interpolation: principle of stationary potential energy - problems having many d.o.f - potential energy of an elastic body - the Rayleigh-Ritz method - piecewise polynomial field - finite element form of Rayleigh-Ritz method - finite element formulations derived from a functional - interpolation - shape functions for C0 and C1 elements - lagrangian interpolation functions for two and three dimensional elements

Module 3

Displacement based elements for structural mechanics: formulae for element stiffness matrix and load vector - overview of element stiffness matrices - consistent element nodal vector - equilibrium and compatibility in the solution - convergence requirements - patch test - stress calculation - other formulation methods.

Module 4

The isoparametric formulation: introduction - an isoparametric bar element - plane bilinear element - summary of gauss quadrature - quadratic plane elements - direct construction of shape functions for transition elements - hexahedral (solid) isoparametric elements - triangular isoparametric elements - consistent element nodal loads - validity of isoparametric elements - appropriate order of quadrature - element and mesh instabilities - remarks on stress computation.

Module 5

Bending flat plates: plate bending theory - finite elements for plates - triangular discrete Kirchoff element - boundary conditions. **Introduction to weighted residual method:** some weighted residual methods - galerkin finite element method - integration by parts - axially loaded bar - beam - plane elasticity.

Text/Reference Books:

1. Desai C.S., *Elementary Finite Element Method*, Prentice Hall of India.
2. Chandrupatla T.R. & Belegundu A.D., *Introduction to Finite Elements in Engineering*, Prentice Hall of India
3. Bathe K.J., *Finite Element Procedures in Engineering Analysis*, Prentice Hall of India.

BCE 728 STRUCTURAL OPTIMIZATION

3L+1T+0P+3.5C

MM: 100

Module 1

Introduction and scope; Simultaneous failure mode and design; Classical external problems and calculus of variation.

Module 2

Variational principles with constraints, linear programming, integer programming, nonlinear programming,

Module 3

Dynamic programming, geometric and stochastic programming.

Module 4

Applications to structural steel and concrete members, trusses and frames.

Module 5

Design under frequency constraints, design of layouts.

Text/Reference Books:

1. Engineering Optimization by Singiresu S. Rao, New Age International Pub., New Delhi
2. Operational Research in Indian Steel Industry by J. Shah and A. Tripathy, New Age International Pub., New Delhi.

BCE 729 GEO-SYNTHETICS ENGINEERING

3L+1T+0P+3.5C

MM: 100

Module 1

Basic Description of Geosynthetics: Historical Development, The Nomenclature, Function, Use around the World, Applications, Development in India. Raw Materials – Their Durability and Ageing: Raw Materials, Durability, Degrading Agencies, Polymers, Biological Resistance, Chemical Resistance, Weathering Resistance

Module 2

Manufacturing Methods: Fibres, Yarn, Nonwoven Geotextiles, Woven Geotextiles, D.S.F. Fabrics. **Geogrids- Testing and Evaluation:** Factors influencing Testing, Sampling, Physical Properties, and Mechanical Properties under Uniaxial loading, Creep Testing

Module 3

Erosion Control with Geogrids: Wind Erosion, Rain Water Erosion, Erosion Control Measures, Placement of Geogrid.

Module 4

Bearing Capacity Improvement with Geogrids: Advantages, Mechanism, Modes of Failure, Friction Coefficient, Experimental Studies.

Module 5

Application of Geosynthetics in Water Resource Projects: Case Study: Dharoidam, Hiran II Dam, Meda Creek Irrigation Scheme, Lining of Kakrapar Canal

Text/Reference Books:

1. Designing with Geosynthetics, (Prentice Hall) by Robert M. Koerner.
2. Engineering with Geosynthetics, (Tata MacGraw Hill) by G.V. Rao & G.V.S. Raju.

BCE 730 SEISMIC DESIGN OF STRUCTURES

3L+1T+0P+3.5C

MM: 100

Module 1

Engineering seismology Causes of earthquakes; seismic waves; magnitude, intensity and energy release, characteristics of strong earthquake ground motions, Introduction to theory of vibrations – Flexibility of long and short period structures, concept of response spectrum, Seismic zones.

Module 2

Seismic design concepts Desirable features of earthquake resistant buildings, Building forms for earthquake resistance, Seismic design philosophy, Performance of buildings in past earthquakes, Lessons from structural damage during past earthquakes, Equivalent static lateral earthquake force, codal provisions

Module 3

Structural Dynamics – Response of single degree freedom system, free & forced vibrators Masonry buildings Seismic design based on IS Code only and detailing of masonry buildings,

Module 4

RCC Buildings- Seismic design based on IS Code only and detailing of RCC buildings
Detailing of drawing minimum 6 sheets

Module 5

Steel Buildings Seismic design and detailing of Steel buildings.

Text/Reference Books:

1. Dynamics of Structures: Theory and Application to Earthquake Engineering (2 nd edition) – Anil K Chopra (Pearson Education Publication)
2. IS 1893, IS 13920, IS 4326, IS 13828, Bureau of Indian Standards, New Delhi
3. Design of Earthquake Resistant Buildings – Minoru Wakabayashi (McGraw Hill Publication)
4. Fundamentals of Vibrations – Anderson, R.A. (Mc Millan)
5. Vibration and Stuctural Dynamics – Timoshenko, S. (VanNostrand Co.)
6. Vibration and Structural Dynamics – Mukyopadhyaya (Oxford & IBH)
7. Dynamics of Structural Dynamics- R.W. Clough & J Penzien (Mcgraw Hill Publication)
8. Structural Dynamics (Theory & computations)- Mario Paz (CBS Publishers & Distributions New Delhi).

BCE 731 ARCHITECTURE AND TOWN PLANNING

3L+1T+0P+3.5C

MM: 100

Module 1

Elements of Design: Line direction. Shape, size, texture, value and colour, balance, scale and proportion.

Principles of Design: Repetition, gradation, harmony, contrast and unity, creation of 2D and 3D compositions.

Module 2

The Industrial Revolution: The age of revivals, the emergence of engineer, new materials and techniques and the evolution of balloon frame and steel frame.

Origin of Modern Architecture: definition and concept of modern architecture, various pioneers of modern architecture.

Module 3

Town Planning: Definition and meaning, age of planning, scope and motives of planning, brief history of town planning – its origin and growth, historically development of town planning in ancient valley civilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planning.

Module 4

New Concepts: Garden city movement, Linear city and concentric city concepts, Neighborhood and Radburn, La-cite industrille, Radiant city to present day planning.

Planning Principles: Types of town and their functions, types of town planning – Grid Iron, Radial, Spider webs, Irregular and Mixed, their advantages and disadvantages.

Module 5

Planning Practice and Techniques: Zoning – its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan – Meaning, preparation and realization, the scope of city planning – city rehabilitation and slum clearance.

Text/Reference Books:

1. Cherry, Gordon, “Urban Planning Problems”, Board Hill, London.
2. Sundaram, K.V., “Urban and Regional Planning in India” Vikas Publishing house(P) Ltd.,New Delhi.
3. Gallion A B., Eisner S., “The Urban Pattern” Van Nostrand reinhold, New York.
4. Jon Lang, “A concise history of Modern Architecture in India”, Permanent Black Publishers, New York.
5. Taurus Parke, “A City with view Florence”, I. B. Taurus Publishers, New York.

BCE 732 DISASTER MANAGEMENT

3L+1T+0P+3.5C

MM: 100

Module 1

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

Module 2

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards - Planetary Hazards / Disasters - Extra Planetary Hazards / Disasters - Planetary Hazards - Endogenous Hazards - Exogenous Hazards.

Module 3

Endogenous Hazards - Volcanic eruption - Earthquakes - landslides - Volcanic Hazards / Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards / Disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake.

Module 4

Exogenous hazards / disasters - Infrequent events - Cumulative atmospheric hazards / disasters **Infrequent events:** Cyclones - Lightning - Hailstorms Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters :- Floods - Droughts - Cold waves - Heat waves Floods :- Causes of floods - Flood hazards India - Flood control measures Droughts :- Impacts of droughts - Drought hazards in India - Drought control measures - Extra Planetary Hazards / Disasters - man induced Hazards / Disasters - Physical hazards / Disasters - Soil erosion Soil Erosion: Mechanics & forms of Soil Erosion - Factors 7 causes of Soil Erosion - Conservation measures of Soil Erosion. Chemical hazards / disasters: Release of toxic chemicals, nuclear explosion - Sedimentation processes Sedimentation processes.

Module 5

Emerging approaches in Disaster Management - Three stages 1. Pre-disaster Stage (preparedness) 2. Emergency Stage. 3. Post Disaster stage - Rehabilitation

Text/Reference Books:

1. Disaster Mitigation: Experiences And Reflections by Pradeep Sahni
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman - Cengage Learning R. B. Singh (Ed) Environmental Geography, Heritage Publishers New Delhi.
3. Savinder Singh Environmental Geography, Prayag Pustak Bhawann.
4. Kates, B. I & White, G. F The Environment as Hazards, oxford, New York.

BCE 733 REMOTE SENSING & GIS

3L+1T+0P+3.5C

MM: 100

Module 1

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.

Module 2

Remote Sensing: Introduction and definition of remote sensing terms, Remote Sensing System, Electromagnetic radiation and spectrum, Spectral signature, Atmospheric windows.

Module 3

Different types of platforms, sensors and their characteristics, Orbital parameters of a satellite, Multi concept in Remote Sensing.

Module 4

Image Interpretation: Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth – collection and verification, advantages of multirate and multiband images. Digital Image Processing concept.

Module 5

Geographic Information System (GIS) : Introduction & applications of GIS in map revision, Land use, Agriculture, Forestry, Archaeology, Municipal, Geology, water resources, Soil Erosion, Land suitability analysis, change detection.

Text/Reference Books:

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

BCE 734 INDUSTRIAL WASTE WATER TREATMENT

3L+1T+0P+3.5C

MM: 100

Module 1

Effects of industrial wastes on streams, sewerage systems and wastewater treatment plants.

Module 2

Minimizing the effects of industrial effluents on waste water treatment plants and receiving streams-conservation of water, process change, reuse of waste water, volume reduction, strength reduction, neutralization, equalization and proportioning.

Module 3

Population equivalent. Industrial effluent standards for disposal into inland surface water sources and on land for irrigation.

Module 4

Study of the following Industries from waste generation, quality and its treatment including brief overview of manufacturing process: Textile, tannery, sugar mill, distillery, dairy, pulp & paper, metal plating, oil refinery, nitrogenous fertilizers, thermal power plants and radioactive wastes.

Module 5

Hazardous wastes - Physico chemical treatment - solidification - incineration - Secured landfills- Industrial applications of pollution prevention, Life cycle assessment, and technology assessments.

Text/Reference Books:

1. Industrial and Hazardous Waste Treatment by N. L. Nemerow & A. Dasgupta.
2. Industrial Effluents by N. Manivasakam.
3. Waste Water Treatment by M.N. Rao & A.K. Dutta.

BCE 735 QUANTITY SURVEYING AND VALUATION

3L+1T+0P+3.5C

MM: 100

Module 1

Introduction: Purpose and importance of estimates, principles of estimating. Methods of taking out quantities of items of work. Mode of measurement, measurement sheet and abstract sheet; bill of quantities. Types of estimate, plinth area rate, cubical content rate, preliminary, original, revised and supplementary estimates for different projects.

Module 2

Rate Analysis: Task for average artisan, various factors involved in the rate of an item, material and labor requirement for various trades; preparation for rates of important items of work. Current schedule of rates. (C.S.R.)

Module 3

Estimates: Preparing detailed estimates of various types of buildings, R.C.C. works, earth work calculations for roads and estimating of culverts, Services for building such as water supply, drainage and electrification.

Module 4

Cost of Works: Factors affecting cost of work, overhead charges, Contingencies and work charge establishment, various percentages for different services in building.

Module 5

Valuation: Purposes, depreciation, sinking fund, scrap value, year's purchase, gross and net income, dual rate interest, methods of valuation, rent fixation of buildings.

Text/Reference Books:

1. Estimating & Costing by B.N. Dutta, UBS Publishers & Distributers.
2. Estimating Costing Specification & Valuation in Civil Engg. M .Chakroborty, Bhakti Vedanta, Book Trust, delhi.
3. Quantity Surveying and Valuation by S.C. Rangawala , Charotar Publishing House.

MGT 102 ENTREPRENEURSHIP DEVELOPMENT

3L+0T+0P+3C

MM: 100

Module I: Entrepreneurship: Need, scope and characteristics nature of entrepreneurship Ventures in India: India economic and industrial heritage and entrepreneurial development. Current economic and industrial environment with special reference to entrepreneurial ventures and economic growth Understanding human behavior time management, group dynamics, conflict and stress management.

Module II: SMALL, MEDIUM AND LARGE INDUSTRIAL SECTORS, Industrial potential and identification of opportunities, demand and resource based industries, service sector, corporate entrepreneurship, entrepreneurship and technocrat entrepreneurship.

SSI: Definition and legal frame planning for small enterprise; major policies. Organization of SSI units, reservation of items for SSI units, role of SIDO, NSIC and SSI corporate.

Module III: MARKETING AND PRICE DISTRIBUTION Methods of sales promotion state and central government purchase procedures: promotional and advertising methods. Marketing research polices & strategies, price determinate expert policies. Financing of small scale industries, tax concession to SSI units. Mechinery on Hire Purchases, Controlled & Scarce Raw Materials.

Module IV: Production Planning: Elements of production process managing production life cycle. **PERT, CPM;** managing production support services, product licensing, patenting, International regulations in patenting; certification agencies, ISO9000 and14000, CS8000 series; Testing facilities, Quality Control.

Module V: PROJECT IDENTIFICATION, DECISION making area money, market machinery and material; project planning and executing; working capital management sources and uses of funds; ratio analysis; break even analysis, cost control; time control; Evaluation and preparation of project report.

Text/Reference Books:

1. Organization & Management of Small Scale Industries: Desai J. V. Himalaya, Bombay 1985.
2. Management of Small Scale Industry: 3rd Himalaya. Bombay 1986.
3. The Story of an Entrepreneur: M. Nath, IMT Monographs.
4. Small Industry Entrepreneurs Handbook: Mohan, K.K. Bombay Productivity Services International.
5. Handbook of Entrepreneurship: Rao & Pareek. New Delhi: learning System 1978

BCE 704 PROJECT-I

0L+0T+4P+2C

MM: 100

To improve the professional competency and research aptitude by touching the areas which otherwise not covered by theory or laboratory classes. The project work aims to develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

BCE 707 MX ROAD

0L+0T+2P+1C

MM: 100

Sr. No.	Topics
1	View controls
2	Carriageway design
3	Survey inputs and validation
4	Junction design
5	String names and Drawing styles
6	Shoulder design
7	Point Selection Methods
8	Pavement design
9	Surface checker
10	Dynamic report
11	String creation and editing
12	Section views
13	Surface analysis
14	Final drawings
15	Earthwork calculation
16	Alignment creation
17	Horizontal
18	Vertical
19	Best fit

B. Tech (Civil Engineering)

Semester-VII

BCE 708 DESIGN OF WATER RESOURCES STRUCTURES

0L+0T+2P+1C

MM: 100

Design Problems as per syllabus of theory