B. Tech. – Civil – Full Time

Code No.	Course Title	L	T	P	C
	SEMESTER 3				
THEORY					
BMA201	Mathematics III	3	1	0	4
BCE201	Applied Mechanics	3	1	0	4
BCE203	Fluid Mechanics	3	1	0	4
BCE215	Building Materials and Construction	3	0	0	3
BCS233	Computer Programming Language	3	0	0	3
BCE207	Surveying I	3	0	0	3
LABORATORY					
BCE209	Survey Practical I	0	0	2	1
BCS245	Computer lab	0	0	2	1

Total credits……23

Code No.	SEMESTER 4	L	T	P	C
THEORY					
BMA206	Numerical methods	3	0	0	3
BCE202	Strength of materials	3	1	0	4
BCE218	Applied hydraulics & hydraulics machinery	3	1	0	4
BCE220	Concrete and Construction Technology	3	1	0	4
BCE208	Engineering Earth science	3	0	0	3
BCE222	Surveying II	3	0	0	3
LABORATORY					
BCE212	Fluid mechanics & hydraulics machinery lab	0	0	2	1
BCE214	Strength of materials and Concrete lab	0	0	2	1
BCE216	Practical training for four weeks	0	0	1	1

Total credits……24

Code No.	SEMESTER 5	L	T	P	C
THEORY					
BCE301	Structural Analysis I	3	1	0	4
BCE317	Design of Steel structures	3	1	0	4
BCE319	Transportation Engineering I	3	0	0	3
BCE321	Environmental Engineering I	3	0	0	3
BCE323	Soil Mechanics	3	1	0	4
BCE311	Basics of Remote Sensing and GIS	3	0	0	3
LABORATORY					
BCE313	Soil Mechanics Lab	0	0	2	1
BCE315	Survey Practical II	0	0	2	1

Total credits……23

Code No.	Course Title	L	T	P	C
	SEMESTER 6				
THEORY					
BCE302	Structural Analysis II	3	1	0	4
BCE318	Design of Concrete Structures	3	1	0	4
BCE306	Transportation Engineering II	3	0	0	3
BCEEXX	Elective I	3	0	0	3
BCE320	Environmental Engineering II	3	0	0	3
BCE322	Foundation Engineering	3	1	0	4
LABORATORY					
BCE312	Computer Aided Building Drawing	0	0	2	1
BCE314	Environmental Engineering Lab	0	0	2	1
BCE316	Survey camp	0	0	3	1

Total credits……24

Code No.	SEMESTER 7				
THEORY		L	T	P	C
BCE401	Estimating and Quantity Surveying	3	0	0	3
BCE403	Design of Concrete and Masonry Structures	3	1	0	4
BCE405	Prestressed concrete structures	3	1	0	4
BCE407	Construction Management	3	1	0	4
BCEEXX	Elective II	3	0	0	3
BCEEXX	Elective III	3	0	0	3
LABORATORY					
BCE409	Structural Analysis and Design Lab	0	0	2	1
BCE411	Transportation Engineering Lab	0	0	2	1
BCE413	Seminar	0	0	2	1

Total credits……24

	SEMESTER 8				
THEORY		L	T	P	C
BCE402	Structural Dynamics and Earth quake Engineering.	3	1	0	4
BCE404	Professional Ethics	3	0	0	3
BCE406	Total Quality Management	3	0	0	3
LABORATORY					
BCE408	Project Work	0	0	16	8

Total credits……18

TOTAL CREDITS FOR ALL THE SEMESTERS = 44+47+47+42 =180

Code No.	Old code No.	Course Title	L	T	P	C
	ELECTIVE OFFERED IN EVEN SEMESTER (Elective 01)					
BCEE02	BCE 001	Ground Water Engineering	3	0	0	3
BCEE04	BCE 002	Water Resources Engineering	3	0	0	3
BCEE06	BCE 003	Coastal Zone Management	3	0	0	3
BCEE08	BCE 004	Hydrology	3	0	0	3
BCEE10	BCE 005	Irrigation Engineering	3	0	0	3
	ELECTIVE OFFERED IN ODD SEMESTER (Elective 02 & 03)					
BCEE01	BCE 006	Transportation Planning and Systems	3	0	0	3
BCEE03	BCE 007	Traffic Engineering and Management	3	0	0	3
BCEE05	BCE 008	Housing planning and design	3	0	0	3
BCEE07	BCE 009	Railways and harbour –planning and design	3	0	0	3
BCEE09	BCE 010	Geographical Information System	3	0	0	3
BCEE11	BCE 011	Cartography	3	0	0	3
BCEE13	BCE 012	Electronic Surveying	3	0	0	3
BCEE15	BCE 013	Environmental Impact Assessment	3	0	0	3
BCEE17	BCE 014	Industrial Waste Management	3	0	0	3
BCEE19	BCE 015	Air Pollution Management	3	0	0	3
BCEE21	BCE 016	Municipal Solid Waste and Management	3	0	0	3
BCEE23	BCE 017	Ecological Engineering	3	0	0	3
BCEE25	BCE 018	Bridge Structures	3	0	0	3
BCEE27	BCE 019	Storage Structures	3	0	0	3
BCEE29	BCE 020	Design of Plate and Shell Structures	3	0	0	3
BCEE31	BCE 021	Tall Buildings	3	0	0	3
BCEE33	BCE 022	Structural Dynamics	3	0	0	3
BCEE35	BCE 023	Pre fabricated Structures	3	0	0	3
BCEE37	BCE 024	Wind Engineering	3	0	0	3
BCEE39	BCE 025	Industrial Structures	3	0	0	3
BCEE41	BCE 026	Smart Structures and Smart Materials	3	0	0	3
BCEE43	BCE 027	Finite Element Analysis	3	0	0	3
BCEE45	BCE 028	Off shore Structures	3	0	0	3
BCEE47	BCE 029	Earthquake - resistant Structures	3	0	0	3
BCEE49	BCE 030	Pavement Engineering	3	0	0	3
BCEE51	BCE 031	Ground Improvement Techniques	3	0	0	3
BCEE53	BCE 032	Rock Engineering	3	0	0	3
BITE31	BCE 030	Information Technology	3	0	0	3

BMA201 MATHEMATICS III 3 1 0 4

1. MARTRICES 12

Characteristic Equation – Eigen Values And Eigen Vectors of a Real Matrix – Cayley – Hamilton Theorem – Orthogonal Reduction of a Symmetric Matrix to Diagonal Form – Orthogonal Matrices – Reduction of Quadratic form to Canonical Form by Orthogonal transformation – Applications

2. ALGEBRA 12

Binomial, Exponential, Logarithmic series – Problems on Summation, Approximate and Co- efficients.

3. TRIGONOMETRY AND COMPLEX FUNCTIONS 12

Expansions of Sin nθ,Cos nθ in powers of Sin θ and Cos θ - Expansion of Tan nθ - Expansions of Sin θ and Cos θ in terms of Sines and Cosines of Multiples of θ - Hyperbolic Functions – Inverse Hyperbolic Functions – separation of Complex Functions into real and Imaginary parts.

4. FUNCTIONS OF SEVERAL VARIABLES 12

functions of two Variables – Partial Derivatives – Total Differential – Differentiation of Implicit Functions – Taylor's Expansion – Maxima and Minima by Lagrange's Method of Undertermined Multiples – Jacobairs – Differentiation under Integeral

5. LAPLACE TRANSFORM 12

Transform of Simple Functions – Basic Operational Properties – Transforms of Derivative and Intergals – Initial and Final Value Theorems – Inverse Transforms – Convolution Theorem – Periodic Functions – Appliciations of Laplace Transform for Solving Linear ordinary Differential Equations of First Order with Constant Co-efficients.

Total = 60

Text Books:

1. Kreyszig, E., " Advanced Engineering Mathematics " (8th Edition), John Wiley and Sons, (Asia) Pte Ltd.,Singapore, 2001.
2. T.Veerarajan , Engineering Mathematics for I Yr. (First Revised) – Tata Mc Graw hill Publishing Co., New Delhi (1999)
3. T.Veerarajan , Engineering Mathematics for I Yr. (First Revised) – Tata Mc Graw hill Publishing Co., New Delhi (2002)

References:

1. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " Engineering Mathematics ", Volumes II & III (4th Revised Edition), S. Chand & Co., New Delhi, 2001.
2.B.S Grewal, Higher Engineering Mathematics (35th ed) S.Viswanathan (Printers and Publishers) (1992).
3. Venkataraman, M.K. " Engineering Mathematics " – First Year – National Publishing Co., Chennai (2nd ed) (2000).
4. S.Narayanan, T.K. Manikavachagam Pillai, And G. Ramanaiah, Advanced Mathematics for Engineering Students – Vol I (2nd ed) S.Viswanathan (Privters and Publishers) (1992).
5. N.piskunov, Differential and Intergal Calculus, Vols I II – MIR Pub, Moscow (1981)

BCE201 APPLIED MECHANICS 3 1 0 4

1. STATICS OF RIGID BODIES : 12

Equivalent system of forces, rigid bodies, external & internal forces-Application of Statics of Particles-Free body Diagram Concurrent & Non Concurrent Forces -Principles of transmissibility-Equivalent force & Varignon's theorem.

Geometrical properties of sections.

Centroid, centroidal axes – moments of inertia – polar moment of inertia – Principal moment of inertia –Graphical treatment – center of gravity of solids by integration.

2.STRESS AND STRAIN AT A POINT. 12

Tension, compression, and shear stress – Hooks's law simple problems – compound bars - relationship between Elastic constants – Thermal stresses. Combined stresses – Principle stress and principal planes – Graphical treatement – streeses in thin cylinders and shells.

3.ANALYSIS OF STATICALLY DETERMINATE PLANE TRUSSES. 12

Stability and equalibrium of plane frames – perfect frames - types of trusses – analysis of forces in trusses member – method of joins – method of sections – tension co-efficient method – graphical method

4. BENDING MOMENT & SHEAR FORCE 12

Introduction to Bending and S.F- Beams and support conditions – types of supports – types of loads - shear forces and bending moment diagrams for simply supported beams, cantilevers and overhanging beams with all loads.

5.TORSION & SHEAR STRESS 12

Theory of torsion-torsion of circular and hollow circular shafts and shear stresses due to torsion-closed and open coiled helical springs, leaf springs and spiral springs.

Total = 60

Text Books:

1.R.S.Kurmi,A Text of Engineering Mechanics,S.Chand and Co New Delhi,1984.
2.S.Ramamirutham and R.Narayanan,strength of materials,Dhanpat Rai Publications,New Delhi,1989.
3.Srinath,Advanced Mechanics of solids,Tata McGraw Hill Co,New Delhi 1988.

References:

1. Junarkar S.B., " Mechanics of Structures ", Vol.1, 21st Edition, Charotar Publishing House,Anand, India, 1995.
2. Kazimi S.M.A. " Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1991..
3.Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions, 1994..
4.William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions 1994

BCE203 FLUID MECHANICS 3 1 0 4

1. DEFINITIONS AND FLUID PROPERTIES **8**

Definitions - Fluid and Fluid Mechanics - Dimensions and units - Fluid properties - Continum - Concept of system and control volume.

2. FLUID STATISTICS **11**

Pascal's law and Hydrostatic equation - Forces on plane and curved surfaces - Buoyancy – Pressure measurement.

3. FLUID KINEMATICS **9**

Stream, streak and path lines - Classification of flows - Continuity equation - Stream and potential functions –Flow nets - Velocity measurement.

4. FLUID DYNAMICS **13**

Euler and Bernoulli's equations - Application of Bernoulli's equation - Discharge measurement - Hagen Poiseuille equation - Turbulent flow - Darcy Weisbach formula

5. BOUNDARY LAYER, FLOW THROUGH PIPES AND MODEL STUDY **19**

Definition of boundary layer - Thickness and classification - Displacement and momentum thicknesses – Major and minor losses of flow in pipes – Pipes in series and in parellel - Pipe network. Dimensional analysis - Rayleigh's method - Buckingham P -Theorem .

Total = 60

Text Books:

1. Dr.R.K.Bansal., "Fluid Mechanics and Hydraulic Machines ", Lakshmi Publications (P) Ltd., 2005.
2. Fox, Robert W. and McDonald, Alan T., " Introduction to Fluid Mechanics ", John Willey & Sons, 1995.

References:

1. Streeter, Victor L. and Wylie, Benjamin E., " Fluid Mechanics ", McGraw-Hill Ltd., 1998.
2. Natarajan M.K., " Principles of Fluids Mechanics ", Anuradha Agencies, Vidayal Karuppur,Kumbakonam, 1995

BCE 215 BUILDING MATERIALS AND CONSTRUCTION BUILDING MATERIALS 3 0 0 3

1. BRICKS , AGGREGATES AND CEMENT **10**

Bricks – Classification – Manufacturing process – Test on bricks – Aggregate: Natural Stone Aggregate – Industrial By- product – Crushing strength, impact strength, and flakiness – Abrasion resistance – Grading – sand – Bulking. Cement: Cement Ingredients – Manufacturing Process – Types – Testing of Cement

2. MORTAR, CONCRETE AND MODERN MATERIALS **8**

Mortar – Preparation of Lime and Cement Mortar- Concrete – Ingredients – Manufacturing Process – Batching Plant – Ready Mix Concrete - Paints - Plastics - Glass

BULIDING CONSTUCTION

3. SUB STRUCTURE AND SUPER STRUCTURE **9**

Substructure – Setting Out of Foundation and Trenches – Excavation and Timbering – Foundation – Shallow Foundation – Deep Foundation. Super Structure – Stone Masonry - Brick Masonry – Hollow Block Masonry.

4. FLOORING , ROOF - STAIR CASE **10**

Ground Floors - Components – Types – Upper Floors – Types. Roofs: Types – Pitched Roof, Shell Roof – Roof Covering Details. Stair Case – Definition – Types of Stair – General Dimension and Requirements – Layout of Stair Case.

5. BUILDIND SERVICES **8**

Damp Proofing- Acoustics Treatment – Thermal Insulation – Fire Protection – Ventilation – Earth Quake Protection

Total = 45

TEXT BOOKS

1. Rangawala, S.C. Engineering Materials, Charotar Publishing House, 8th ed. 1983.
2. Thomas. C. Jester, 20th Century Building Materials, Tata McGraw-Hill Publications, 1997
3. R.K. Rajput, Engineering materials, S.Chand & Company limited, 2000
4. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat roy and Sons, 1997.

REFERENCES

1. Taylor, G.D. Materials of Construction, USA Longman Inc, 1989.
2. Arora and Bindra, Building Materials and Building Construction, Dhanpat Raj & Sons, 1994.
3. B.C.Punmia, Building Construction, S.Chand &co,NewDelhi 1988.

BCS233 COMPUTER PROGRAMMING LANGUAGES 3 0 0 3

1.INTRODUCTION **12**

Programming and compliers, system software and application software, basic concepts on Database Management Principles, definition of operating systems and their commercial versions, description of hardware units and supporting devices, basic concepts and networking visit to computer laboratory.

2.C LANGUAGE **12**

Fundamentals – data types – operators – expressions – statements – control flow – conditional statements – storage devices – preprocessor statements – Arrays – pointers – input output functions – sting.

3.ADVANCED C PROGRAMMING **12**

Recursive functions – structures pointers to structures – pointers to pointers – pointer to functions – unions lined lists – binary free applications – command line arguments – file handling, applications of C in civil engineering structural design.

4.C++ **12**

Fundamentals of Object orient programming C++ data types – functions and scope – arguments passing – reference argument – inline function – overloaded functions – class – objects – member functions – friends – operator over handling – constructors and destructors.

5.C++ **12**

Structure pointer – memory sharing operations – array of classes – derived classes – inheritance – public and private classes – pointer – generic classes – input output strings - files – application of C++ in civil engineering structural design.

Total = 60

Reference books:

1.E.Balaguruswamy, programming with ANSI C, Tata McGraw Hill Co.,New Delhi,1998.
2.Balaguruswamy.E,Object Oriented Programming with C++, McGraw Hill Co.,New Delhi,1998.
3.Gerald V, Post Database Management System, McGraw Hill International Edn,,New Delhi,1999.
4.Robert Lafore , Object Oriented Programming with ms c++, Galgotia Publications, .,New Delhi,1998.
5.Goldfried,B.S,Programming with C.Schaum Outline Series, Tata McGraw Hill Co., .,New Delhi, 1998.
6.Raghu Ramakrishnan ,Data base Management System ,McGraw Hill Co., .,New Delhi,1998.

BCE207 SURVEYING I **3 0 0 3**

1. INTRODUCTIONS AND CHAIN SURVEYING **8**

Definition - Principles - Classification - Survey instruments - Ranging and chaining - Reciprocal ranging - Setting perpendiculars –Errors - Traversing.

2. COMPASS SURVEYING AND PLANE TABLE SURVEYING **7**

Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction – Magnetic declination - Dip - adjustment of error - Plane table instruments and accessories – Merits and demerits - Methods - Radiation - Intersection - Resection.

3. LEVELLING AND APPLICATIONS **12**

Level line - Horizontal line - Levels and Staves - Sprit level - Bench marks - Temporary and permanent adjustments - Fly and Check leveling - reciprocal leveling - Longitudinal and cross sections.

4.CONTOURING **8**

Contouring - Methods –Characteristics and uses of contours - Plotting - Calculation of areas and volumes- Earth work volume.

5. THEODOLITE SURVEYING **10**

Theodolite - Vernier - Description and uses - temporary and permanent adjustments of Vernier transit – Swing-Horizontal angles - Vertical angles – measurements of angles and distances - Omitted measurements.

Total = 45

Text Books:

1. Bannister A. and Raymond S., “Surveying ", ELBS, Sixth Edition, .,New Delhi,1992.
2. Heribert Kahmen and Wolfgang Faig, “Surveying ", Walter de Gruyter, London,1995.
3. Kanetkar T.P., “Surveying and Levelling ", Vols. I and II, United Book Corporation, Pune, 1994.
4. Punmia B.C., " Surveying ", Vols. III, Laxmi Publications,Mumbai, 1999 and I, II.
5. N.N Basak ., “ Surveying and Levelling ", Tata McGraw – Hill Publishing Company Limited New Delhi, 2004.

References:

1. Clark D., " Plane and Geodetic Surveying ", Vols. II and C.B.S. Publishers, I and Distributors, New Delhi, Sixth Edition, 1991.
2. James M. Anderson and Edward M. Mikhail, " Introduction to Surveying ", McGraw Hill Book Company, .,New Delhi, 1995

BCE209 Surveying Practical – 1 **0 0 2 1**

1.**Chain Surveying** **4**

Ranging – Chaining – Traverse

2. **Compass Surveying** **4**

Traverse

3. **Plane Table Surveying** **6**

Triangulation to find distance between inaccessible points with and without known scale – Three-Point Problem – Two-Point Problem.

4. **Levelling** **8**

Study of levels and leveling staff – Fly leveling using dumpy level – Fly leveling using tilting level – Check leveling.

5. **Theodolite** **8**

Study of Theodolite Measurement of angles by reiteration and repetition – Measurement of vertical angles

Total = 30

Text Books:

1. Punmia B.C., " Surveying ", Vols. III, Laxmi Publications, Mumbai,1999 and I, II.
2. N.N Basak ., “ Surveying and Levelling ", Tata McGraw – Hill Publishing Company Limited New Delhi, 2004.

References:

1. Clark D., " Plane and Geodetic Surveying ", Vols. II and C.B.S. Publishers, I and Distributors, New Delhi, Sixth Edition, 1991.
2. James M. Anderson and Edward M. Mikhail, " Introduction to Surveying ", McGraw Hill Book Company, .,New Delhi,1995

BCS245 COMPUTER LABORATARY (C,C++) **0 0 2 1**

NOTE: The student has to write the programs in C & C++ for the following exercises and test for their correctness.

1.Solving of Quadratic equations for all conditions.
2.Summation of Sine and Exponential series.
3.Matrix operations (Addition, subtraction multiplication, transpose, inverse)
4.Sorting (Descending & Ascending)
5.Curve Fitting –linear.
6.Surveying Problems (Conversions W.C.B to R.B & R.B to W.C.B)
7. Computations of volumes-trapezoidal & Simpson’s rule.
8. Structural design problems (BMD & SFD –simple end conditions).

9.Probllems on flow through pipes. (Venturimeter,orifice-meter) using C.
10. Define a class fluid with member variables like mass, volume, gravity, distance between plates, velocity, area of contact etc and member functions like density, weight density, dynamic viscosity, kinematics viscosity with inheritance implemented and allowing different system of units by operator overloading. (Ensure Encapsulation) using C++.
1.Also check whether a fluid is Newtonian or non Newtonian after creating instances for different types of fluids.
2.Write a program to compute discharge for any type of notch or weir. Implement multiple inheritances by inheriting Trapezoidal notch class from rectangular &triangular notches.

Total = 30

Reference books:
1.E.Balaguruswamy, programming with ANSI C, Tata McGraw Hill Co., .,New Delhi,1998.
2.Balaguruswamy.E,Object Oriented Programming with C++, McGraw Hill Co., .,New Delhi,1998.
3.Gerald V, Post Database Management System, McGraw Hill International Edn, .,New Delhi,1999.
4.Robert Lafore , Object Oriented Programming with ms c++, Galgotia Publications, .,New Delhi,1998.
5.Goldfried,B.S,Programming with C.Schaum Outline Series, Tata McGraw Hill 2000, .,New Delhi, Co.,1998.
6.Raghu Ramakrishnan ,Data base Management System ,McGraw Hill Co.,1998.

BMA206 NUMERICAL METHODS **3 0 0 3**

1. SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS **9**

Method of false position, Iterative method, Newton-Raphson method for single variable and for simultaneous equations with two variables, Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobian and Gauss-Seidel methods. Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by Power and Jacobi Methods.

2. INTERPOLATIONS AND APPROXIMATION **9**

Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, central difference, Least square polynomial approximations.

3. NUMERICAL DIFFERENTIATION AND INTEGRATION **10**

Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson's (both 1/3 rd and 3/8 th) rules. Rombergs rule Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson's rule.

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS **9**

Single Step Methods - Taylor Series, Euler and Modified Euler, Runge-Kutta method of fourth order first andsecond order differential equations. Multistep Methods - Milne and Adam's-Bashforth predictor and corrector methods.

5. BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS **8**

Finite difference solution for the second order ordinary differential equations, Finite difference solution for one dimensional heat equation (both implicit and explicit). One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total = 45

Text Books:
1. Sastry, S.S., " Introductory Methods of Numerical Analysis (Third Edition) ", Prentice Hall of India,New Delhi, 1998.
References:
1.Kandasamy, P., Thilakavathy, K. and Gunavathy, K., " Numerical Methods ", S. Chand & Co., New Delhi, 1998.
2. Grewal, B.S. and Grewal, J.S., " Numerical Methods in Engineering and Science ", Khanna Publishers,New Delhi, 1999.
3. Jain M.K., Iyengar, S.R.K. and Jain, R.K., " Numerical Methods for Engineering Scientific and computations (Third Edition) ", Wiley Eastern Ltd, New Delhi, 1987.
4. Gerald, C.F., and Wheatley, P.O., " Applied Numerical Analysis (Fifth Edition) ", Addison Wesley,Singapore, 1998.
5. Narayanan, S., Manicavachagam Pillai,T.K. and Ramanaiah, G., " Advanced Mathematics for Engineering Students - Volume-III ", S.Viswanathan Pvt., Ltd.1988, .,New Delhi,

BCE202 STRENGTH OF MATERIALS **3 1 0 4**

1. ENERGY PRINCIPLES **11**

Strain energy and strain energy density - Strain energy in tension, shear, flexure and torsion - Castigliano's & Engessor's energy theorems

2. DEFLECTIONS. **12**

Methods of Deflection – Determinate Beams-Double Integration – Macaulay's – Moment Area –Conjugate Beam.

3. INDETERMINATE BEAMS **11**

Propped Cantilever and Fixed Beams - Fixed End Moments and Reactions for Standard cases of Loading - Continuous Beams - Theorem of Three Moments - Analysis of Continuous Beams - S.F. and B.M. Diagrams for Continuous Beams.

4. COLUMNS **13**

Eccentrically Loaded Short Columns Middle Third Rule - Core of Section - Columns of Unsymmetrical Sections - Rankine – Gordon Formula Eccentrically Loaded Long Columns.Theories of Failure - Principal Stress, Principal Strain, Shear Stress, Strain Energy and Distortion Energy Theories.

5. ADVANCED TOPICS IN BENDING OF BEAMS **13**

Unsymmetrical Bending of Beams of Symmetrical and Unsymmetrical Sections - Curved Beams – Thin Cylinders - Winkler Bach Formula (Only Theory) - Shear Center (only theory) Residual Stresses (only theory) - Stress Concentration (only theory) - Fatigue and Fracture (only theory).

Total = 60

Text Books:
1. Egor P. Popov, " Engineering Mechancis of Solids ", Prentice Hall of India, New Delhi, 1997.
2. Srinath N., " Advanced Mechanics of Solid ", Tata McGraw Hill Publishing Company, New Delhi, 1994.
3. Prakash Rao B.S., " Strength of Materials, a Practical Approach ", University Press (India) Ltd., New Delhi,1999.

References:

1. Junarkar S.B., " Mechanics of Structures ", Vol.1, 21st Edition, Charotar Publishing House,Anand, India, 1995.
2. Kazimi S.M.A. " Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1991..
3.Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions, New Delhi,1994..
4.William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions, New Delhi, 1994

BCE218 APPLIED HYDRAULICS & HYDRAULICS MACHINERY 3 1 0 4

FLOW IN OPEN CHANNEL

1. INTRODUCTION **11**

Open Channel Flow - Types and Regime of Flow - Velocity Distribution in Open Channel - Specific Energy - Critical Flow and its Computation.

2. UNIFORM FLOW **14**

Uniform Flow - Velocity Measurement - Manning's and Chezy's Formula - Determination of Roughness Coefficients - Determination of Normal Depth and Velocity - Most Economical Sections.

3. HYDRAULIC JUMP **11**

Hydraulic Jump - Types - Energy Dissipation - Surges - Surge through Channel Transitions.

PUMPS AND TURBINES

4. PUMPS **15**

Introduction – Classification – Rotodynamic Pumps: Centrifugal Pumps – Work Done – Losses - Specific Speed- Multistage Pumps. Positive Displacement Pumps - Reciprocating Pump - Slip - Air Vessels (Theory Only)

5. TURBINES **9**

Classification - Radial Flow Turbines - Axial Flow Turbines – Draft Tube and Cavitations

Total = 60

Text Books:

1. Subramanya K., "Flow in Open channels ", Tata McGraw Hill Publishing Company, New Delhi, 1994.
2. Kumar K.L., "Engineering Fluid Mechanics ", Eurasia Publishing House (P) Ltd., New Delhi, (7th Edition), 1995.
3. Dr.R.K.Bansal., "Fluid Mechanics and Hydraulic Machines ", Lakshmi Publications (P) Ltd.,Pune, 2005.

References:

1. Ven Te Chow, "Open-Channel Hydraulics ", McGraw - ,New York,H:Q Book company, 1996.
2. Ramamirtham S., "Fluid Mechanics, Hydraulics and Fluid Mechines ", Dhanpat Rai & Sons, Delhi, 1998.
3. John A. Roberson, "Hydraulic Engineering ", Jaico Publishing House, New Delhi, 1998

BCE 220 CONCRETE AND CONSTRUCTION TECHNOLOGY 3 1 0 4

1. CONCETE TECHNOLOGY **11**

Introduction – Workability of Concrete – Testing of Fresh and Hardened Concrete – Non-Destructive Testing – High Strength Concrete – Other Types of Concrete: Fibre Reinforced Concrete – Polymer Concrete – Sprayed concrete – Ferrocement - Concrete Chemicals

2. **CONCRETE MIX DESIGN** **10**

Concept of Mix Design - Statistical Quality control of Concrete - Mix design by I.S. code method, ACI method and DOE method – Other methods of Mix Design (Procedure)

3. CONSTRUCTION PRACTICES **12**

Specifications, detail and Sequence of activity and Construction Co-ordination – Site Clearance- Marking – Construction and Expansion joints – Shuttering and Deshuttering – Slip form – Scaffolding – Shoring – Fabrication and Erection of Steel works.

4. SUBSTRUCTURE AND SUPER STRUCTURE CONSTRUCTION **15**

Substructure: Techniques of Box Jacking – Pipe Jacking – Under Water Construction of Diaphragm walls and Basement – Piling Techniques – Sheet piles – Shoring for deep cutting – Dewatering. Superstructure: Launching Girders and Deck slab – Aerial Transporting Handling – Construction Sequences in Cooling Towers, Silos and Chimneys – Prestressed construction.

5. **REPAIR AND REHANILITATION WORKS AND EQUIPMENTS** **12**

Study and causes of building damage and deterioration – Assessment of materials and methods of Repair. Equipments – Types of earth work equipments – Tractors, Scrappers and Earth movers – equipment for concreting, material handling and Erection of structures.

Total = 60

TEXT BOOKS

1. Shetty. M.S., Concrete Technology, S.Chand and Co, Pune,1984
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat roy and Sons, New Delhi, 1997.
3. Peurifoy, R.L., Ledbetter, W.D and Schexnayder, C., 'Consruction Plaaning, Equipment and Methods' V Edition McGraw hill, Singapore, 1995.

REFERENCES

1. Krishnasamy. K.T., Concrete Technology, Dhanapt Rai - New Delhi – 1985
2. Neville, Properties of concrete ELBS, 1977.
3. Sharma S.C., Building Construction, Khanna Publishers, New Delhi.1998
4. Jha J and Sinha S.K., Construction and Foundation Engineering, Khanna Publishers, Pune,1993.

BCE208 ENGINEERING EARTH SCIENCE 3 0 0 3

1. GENERAL GEOLOGY **9**

Geology in Civil Engineering - Branches of geology - Earth Structure and composition - Elementary knowledge on continental drift and plate techtonics. Weathering - Work of rivers, wind,glaciers and sea and their engineering importance

2. MINERALOGY **9**

Elementary knowledge on symmetry elements of important crystallographic systems - physical properties of minerals - study of the following rock forming minerals - Quartz family. Feldpar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet - properties, behaviour and engineering significance of clay minerals –Fundamentals of process of formation of ore minerals - Coal and Petroleum - Their origin and occurence in India.

3. PETROLOGY **9**

Classification of rocks - Distinction between Igneous, Sedimentatary and Metamorphic rocks. Decription occurence, engineering properties and distribution of following rocks. Igneous rocks - Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt Sedimentary rocks sandstone, Limestone, Shale Conglo, Conglomerate and breccia. Metamorphic rocks, Quartzite, Marble, Slate, Thyllite, Gniess and Schist.

4. STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD **9**

Attitude of beds - Outcrops - Geological maps - study of structures - Folds, Faults and points - They're bearing on engineering Construction. Seismic and Electrical methods for Civil Engineering investigations.

5. GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING **9**

Remote sensing techniques - study of air photos and satellite images - Interpretation for Civil Engineering Projects - Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Land slides - causes and preventions. Sea erosion and coastal Protection.

Total = 45

Text Books:

1. Parbin Singh, " Engineering and General Geology ", Katson Publication House, Pune,1987.
2. Krynine and Judd, " Engineering Geology and Geotechniques ", McGraw Hill Book Company,New Delhi 1990.

References:

1. Legeet, " Geology and Engineering ", McGraw Hill Book Company,New Delhi, 1998.
2. Blyth, " Geology for Engineers ", ELBS,Pune 1995

BCE222 SURVEYING II 3 0 0 3

1. ENGINEERING SURVEYS **9**

Curve ranging - Horizontal and vertical curves - Simple Curves - setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transistion curves - Functions and requirements - Setting out by offsets and angles - Vertical curves

2. TACHEOMETRIC SURVEYING **9**

Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Anallactic lens – Subtense bar.

3. CONTROL SURVEYING **9**

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line –Instruments and accessores - Corrections - Satellite station - Reduction to centre - Trignometric levelling – Single and reciprocal observations - Modern trends.

4 SURVEY ADJUSTMENTS **9**

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values –weighted observations - Principle of least squares - Normal equation – Correlates.

5. PHOTOGRAMMETRY - **9**

Photogrammetry - Introduction - Terrestial and aerial Photographs - Stereoscopy -Parallax – Electromagnetic distance measurement - Carrier waves - Principles – Instruments Hydrographic Surveying – Tides - MSL - Sounding and methods - Location of soundings and methods - Three point problem - Strength of fix –Sextants and station pointer - River surveys - Measurement of current and discharge

Total = 45

Text Books:

1. Bannister A. and Raymond S., " Surveying " , ELBS,Pune, Sixth Edition, 1992.
2. Heribert Kahmen and Wolfgang Faig, " Surverying " , Walter de Gruyter, 1995.
3. Kanetkar T.P., " Surveying and Levelling " , Vols. I and II, United Book Corporation, Pune, 1994.
4. Punmia B.C., " Surveying ", Vols. I, II and III, Laxmi Publications, New Delhi, 1999.

References:

1. Clark D., " Plane and Geodetic Surveying " , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.
2. James M. Anderson and Edward M. Mikhail, " Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1985.
3. Wolf P.R. " Elements of Photogrammetry", McGraw Hill Book Company, New Delhi,1988

BCE212 FLUID MECHANICS & HYDRALIC MACHINERY LAB 0 0 2 1

1. Flow Measurement

I. Venturimeter.
II. Orifice meter.
III. Flow meter. **12**

2. Losses in Pipes

Estimation of major Energy losses in pipes **04**

3. Pumps

Performance characteristics of
I. Rated Speed Centrifugal Pump.
II. Multistage Centrifugal Pump.
III. Gear Pump.
IV. Reciprocating pump**.** **10**

4. Turbines

Performance characteristics of Pelton wheel Turbine. **04**

Total = 30

Text Books:

1. Dr.R.K.Bansal., "Fluid Mechanics and Hydraulic Machines ", Lakshmi Publications (P) Ltd.New Delhi 2005.
2. Fox, Robert W. and McDonald, Alan T., " Introduction to Fluid Mechanics ", John Willey & Sons, New jersey,1995.

References:

1. Streeter, Victor L. and Wylie, Benjamin E., " Fluid Mechanics ", McGraw-Hill Ltd.New Delhi, 1998.
2. Natarajan M.K., " Principles of Fluids Mechanics ", Anuradha Agencies, Vidayal Karuppur, Kumbakonam, 1995

BCE214(a) STRENGTH OF MATERIALS LAB 0 0 2 1

1. Tension test on mild steel and for steel rods.
2. Compression test on wooden specimen
3. Double shear test on mild steel and aluminum rods.
4. Torsion test on mild steel rod.
5. Impact test on metal specimen
6. Hardness tests on metals like mild steel, brass, copper and aluminum.
7. Deflection test on metal beam
8. Compression test on helical spring

BCE214 (b) CONCRETE LAB

1.Tests on Cement

To find the Specific Gravity, normal consistency, initial setting time of cement

2. Test on Aggregate
   a. Sieve analysis
   b. Water Absorption
3. Tests on Freshly Mixed Concrete

To find the Compaction Factor, Slump Value, Vee Bee Time and Flow Value

1. Tests on Hardened Concrete
   a. Compressive Strength
   b. Flexural Strength

Total :30

BCE 216 Practical Training For Four Weeks 0 0 1 1

- This Practical Training has been included in the curricullam for the civil Students to have exposure in field activities.
- Here The students are advised to under go a training in an organization for 4 weeks.
- They are free to under go training in an Reputed organization.
- After completing their training They have to submit a report

Duration 4 weeks

BCE301 STRUCTURAL ANALYSIS I 3 1 0 4

1. DEFLECTION OF DETERMINATE STRUCTURES 9

Principles of virtual work for deflections - Deflections of pin-jointed plane frames and rigid plane frames.

2. MATRIX METHOD FOR INDETERMINATE FRAMES 15

Equilibrium and compatibility - Determinate Vs indeterminate structures –Indeterminacy - primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams. Element and global stiffness and flexibility matrices– Co-ordinate transformations – transformations of stiffness matrices - Analysis of Continuous Beams.

3. SLOPE DEFLECTION METHOD 12

Continuous beams and rigid frames (with and without sway) - Symmetry and Asymmetry – Simplification for hinged end - Support displacements.

4. MOMENT DISTRIBUTION METHOD 12

Stiffness and carry over factors – Distribution and carry over of moments - Analysis of continuous Beams - Plane rigid frames with and without sway.

5. MOVING LOADS AND INFLUENCE LINES (DETERMINATE) 12

Influence lines for reactions in statically determinate structures – influence lines for member forces in pin jointed frames – Influence lines for shear force and bending moment in beam sections

Total = 60

Text Books

1. Theory of structures – B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi, 1999
2. Indeterminate Structural Analysis – S.J. Kinney, Oxford IBH Publishing Co.,London, 1999.

References:

1. Matrix analysis of framed structures – William Weaver, Jr & James M.Gere, CBS Publishers & Distributors, Delhi, 1995
2. Structural Analysis – A Matrix Approach – G.S.Pandit & S.P.Gupta, Tata McGraw-Hill, New Delhi ,1998
3. Analysis of Structures: Strength and Behaviors T.S. Thandavamoorthy, oxford University press, New Delhi, 2005.

BCE317 DESIGN OF STEEL STRUCTURES 3 1 0 4

1. INTRODUCTION 12

Type of steel structures- properties of rolled steel sections- allowable stresses in steel. Requirements of structural design –steps involved in design-load analysis-types of load- Applicable codes for load estimation- load combination-general design requirements of a steel structure-increase in allowable stresses- light gauge steel as a structural material- uses-and application-applicable IS codes for light gauge steel

2. JOINTS 12

Riveted and bolted connections-failure of joints-simple and multiple riveted lap and butt joints under axial loading –strength of fillet weld and butt welded joints- design of brackets, design of riveted and welded joints for systems subjected to moment in the plane of joints and moment acting at right angles to the plane of joints- -design of joints between beam connected to flange of column-secondary beam connected to web of main beam-beam column connection using seat connections-moment resisting connections

3. TENSION AND COMPRESSION 12

Design of simple and built up members subjected to tension-effective area of angles connected to gusset- maximum slenderness ratio of compression members-IS code provisions of compression members-design of simple and built up compression members with lacing and battens- design of column bases

4. BEAMS 12

Design of simple beams based on strength and stiffness as per IS code- design of built up beams and curtailment of flange plates-connection of flange plate and beams-design of plate girder-design of beam column as per IS code.

5. TIMBER 12

Study of property of natural timber-allowable stresses in compression tension and flexure-types of joints with nails and bolts-design of simple compression members-design of beams for strength and stiffness as per IS code

Total =60

Text Books

1. Ramachandra, Design of Steel structures Vol.1 & II Standard Book House, New Delhi 1992
2. V.N Vazirani and M.M Ratwani, Concrete Structures and Timber Structures, Khanna publishers, New Delhi 1995.
3. V.N Vazirani and M.M Ratwani, Design of Steel Structures, Khanna publishers, New Delhi 1995.

References:

1. Design of Steel Structures Dr. B.C. Punmia Lakshmi Publications New Delhi, 1998
2. P Dayaratnam, Design of Steel Structures, A H Wheeler & Co., New Delhi, 1999

BCE319 TRANSPORTATION ENGINEERING – I 3 0 0 3

1. PLANNING AND ALIGNMENT OF HIGHWAY 9

Highway Development in India, Macadam's Method of Road Construction, Jayakar Committee Recommendations and Realizations, Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques)

Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements –[IRC Standards]

2. GEOMETRIC DESIGN OF HIGHWAYS 9

Design of Horizontal Alignments – Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems]

Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors Affecting Sight Distances, PIEV Theory, SSD, OSD, Sight Distances at Intersections, ISD and Illumination Sight Distances [Derivations and Problems in SSD and OSD]. Geometric Design of Hill Roads [IRC Standards Only]

3. RIGID AND FLEXIBLE PAVEMENTS DESIGN 9

Rigid and Flexible Pavements- Components and their Functions Design Principles of Flexible and Rigid Pavements, Factors Governing and Affecting the Design of Pavements - Design of Flexible Pavements [CBR method, IRC Recommendations- Problems] Design of Rigid Pavements – [IRC Recommendations-Problems]

4. HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9

Desirable Properties and Testing of Highway Materials- Construction Practice - Water Bound Macadam Road, Bituminous Road and cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]

5. PAVEMENT MAINTENANCE 9

Types of Defects in Flexible Pavements and rigid Pavements– Symptoms, Causes and Treatments and Special Repairs. Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation Overlay Design by Benkelman Beam Method [Procedure only]

Total = 45

Text Books:

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000
3. Dr K.P.Subramaniyam,Transportation engineering, Scitech publishers, Chennai 2003

References:

1. IRC Standards,2002
2. Bureau of Indian Standards (BIS) Publications on Highway Materials,1998
3. MORTH, Guidelines for Highway Engineering,1985

BCE321 ENVIRONMENTAL ENGINEERING I 3 0 0 3

1. INTRODUCTION 9

a) Water: Requirement of water to human uses- available surface & sub-surface sources-Conjunctive use –Quality of natural water in the sources – Quality criteria for drinking and other domestic purposes

b) Waste water:Generation of wastewater from domestic uses – Strength of Waste water (B.O.D.,T.S.S.,Nitrates,etc)-Reduction of strength for discharge requirements to the (components of) environment- Possible reuse & Recycle options-Reuse option as one of the water sources-Chemical, Microbiological and aesthetic factors limiting the reuse

2. PLANNING WATER SUPPLY AND COLLECTION CUM DISPOSAL OF SEWAGE 12
(On –site &Off site)

a)Water supply: Need for public water supply system –Identifying water sources – Surface &sub-surface –Quantifying the availability –Water quality-development of Storage, Collection cum intake structures such as Impounding Reservoirs, intakes, Aquifers, wells, infiltration Galleries-Collector wells &Deep Bore wells- Drilling methods Development of Bore wells.

b) Sewage Collection: On-Site: Composting Toilets-Twin-pit Pan Flush Toilets –Septic tank & soil Dispersion system –Grey water (Sullage) Recharge /Recycle –Limitations of on-site sanitation Off-site: Design period –Design Population/ Design flow-Peak flow for a township Public water supply and sewerage systems – Objectives – Design period – Population forecasting – Water demand – Sources of water – Sources Selection – Water quality – Characterization – Sources of wastewater – Quantity of sanitary sewage – Estimation of storm runoff – Characteristics of sewage and their significance.

3. CONVEYANCE OF WATER & WASTE WATER (including inside the premises) 10

a) Water: Hydraulics of flow in pipes – Design of Transmission(Pumping) main Laying, jointing & testing of pipes – appurtenances & their functional Requirements-Water supply pipes & fittings-Pumps-Selection of pumps for Water works.
b) Sewage & Storm water :Hydraulics of flow in sewers – Transmission of sewage through pumping-System of sanitary Plumbing-House sewer connections-Sanitary fittings & fixtures –Design of Storm Sewer –Pumps-Selection of Pumps for Sewage

4. DISTRIBUTION OF WATER &GRAVITY COLLECTION OF SEWAGE 14

a) Water : Components- net work design & analysis- appurtenances and functional Requirements- operation & maintenance- leakage detection.
b) Sewage gravity collection system : design of sanitary sewer- small bore system Interception tank system & condominal sewer- laying, jointing and testing of sewers- appurtenances- structures and functional requirements.

Total = 45

Text Books:

1. Garg, S.K., Environmental Engineering, Vols. II, Khanna Publishers, New Delhi, 1994
2. C.S.Shah, Water Supply and Sanitation, Galgotia Publishing Company, New Delhi, 1994
3. G.S. Birdie & J.S. Birdie, Water Supply and Sanitary Engineering,Dhanpat Rai Publishing Company,Pune, 2006

References:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993.
3. H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering, McGraw-Hill Book Company, New Delhi, 1995.

BCE323 SOIL MECHANICS 3 1 0 4

1. INTRODUCTION 13

Nature of soil - Phase relationships - Soil description and classification for engineering purposes - IS Classification system –- Soil compaction - Theory, comparison of laboratory and field compaction methods – Factors influencing compaction.

2. SOIL WATER AND WATER FLOW 10

Soil water - static pressure in water – Capillary stresses- Permeability measurement in the laboratory and field - Factors influencing Permeability of soil - Seepage –Introduction to flow nets - Simple problems.

3. STRESS DISTRIBUTIONS AND SETTLEMENT 14

Effective stress concepts in solids - Stress distribution in soil media - Use of influence charts - Components of settlement – Factors influencing Settlement of soil -Immediate and consolidation settlement - Terzaghi's one-dimensional consolidation theory – Computation of rate of settlement.

4. SHEAR STRENGTH 11

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass –Measurement of shear strength, direct shear - Triaxial compression, UCC and Vane shear tests - Pore pressure parameters.

5. SLOPE STABILITY 12

Slope failure mechanisms - Types - Infinite slopes - Finite slopes - Total stress analysis for saturated clay –Method of slices - friction circle method - Use of stability number - Slope protection measures.

Total =60

Text Books:

1. V.N.S. Moorthy, " Soil Mechanics and Foundation Engineering ", UBS Publications and Distribution Ltd, New Delhi, 1999.
2. Gopal Ranjan and Rao A.S.R., " Basic and applied soil mechanics ", Wiley Eastern Ltd., New Delhi (India), 1997.
3. Arora K.R., " Soil Mechanics and Foundation Engineering ", Standard Publishers and Distributors, New Delhi, 1997.

References:

1. Holtz R.D. and Kovacs W.D., " Introduction to Geotechnical Engineering ", Prentice-Hall, New Delhi, 1995.
2. McCarthy D.F., " Essentials of Soil Mechanics and Foundations ", Prentice-Hall, New Delhi,97.
3. Sutten B.H.C., " Solving Problems in Soil Mechanics", Longman Group Scientific and Technical, U.K. England, 1994
4. Dass , B.M , "Principles of geotechnical engineering", Thompson books, Singapore ,5th edition, 2002.

BCE311 BASICS OF REMOTE SENSING AND GIS 3 0 0 3

1. REMOTE SENSING 9

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR , Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzman law.

2. EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS **9**

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surface- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface

3. OPTICAL AND MICROWAVE REMOTE SENSING **9**

Satellites - Classification – Based on Orbits – Sun Synchronous and Geo Synchronous – Based on Purpose – Earth Resource Satellites, Communication Satellites, Weather Satellites, Spy Satellites – Satellite Sensors - Resolution – Spectral, Spatial, Radiometric and Temporal Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Land sat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics

4. GEOGRAPHIC INFORMATION SYSTEM **9**

GIS – Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters

5. MISCELLANEOUS TOPICS **9**

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems

Total = 45

Text Books:

1. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications, New Delhi, 2001
2. M.G. Srinivas (Edited by), Remote Sensing Applications, Nervosa Publishing House, New Delhi, 2001.

Reference:

1. Lilles and T.M. and Kiefer R.W. Remote Sensing and Image Interpretation, John Wiley and Sons, Inc, New York, 1987.
2. Janza.F.J, Blue, H.M.,Johnston, J.E., "Manual of Remote Sensing Vol.I, American Society of Photogrammetry, Virginia, U.S.A, 1975.
3. Burrough P A, Principle of GIS for land resource assessment, Oxford, 1990

BCE313 SOIL MECHANICS LAB **0 0 2 1**

1. Specipic gravity of soil solids
2. Grain size distribution - Sieve analysis - Hydrometer analysis
3. Atterberg limits test – Liquid limit, Plastic limit and shrinkage limit tests
4. Field density Test
5. Determination of moisture - Density relationship using standard proctor.
6. Permeability determination (constant head and falling head methods)
7. Direct shear test on cohesion less soil
8. Unconfined compression test in cohesive soil
9. Tri axial compression test in cohesion less soil
10. Laboratory Vane shear test in cohesive soil
11. One dimensional Consolidation test (Determination of coefficient of consolidation only)

Total = 30

References:

1 " Soil Engineering Laboratory Instruction Manual ", Published by the Engineering College Co-operative Society, Chennai, 1996.
2 Lambe T.W., " Soil Testing for Engineers ", John Wiley and Sons, New York, 1990.
3 " I.S.Code of Practice (2720) Relevant Parts ", as amended from time to time..

BCE315 SURVEY PRACTICAL II **0 0 2 1**

1. Tacheometry

Tangential system (using theodolite, leveling staff)
Stadia system (using theodolite, leveling staff)
Sub tense system (using theodolite, tape, cross staff, leveling staff)

2. Setting out works

Foundation marking (using theodolite, tape, ranging rods)
Simple curve - right / left handed (using theodolite, tape, ranging rods)
Transition curve (using theodolite, tape, ranging rods)

3. Field astronomy

Field observation for the calculation of azimuth (using theodolite, tape) **Total = 30**

References:

1. Clark D., " Plane and Geodetic Surveying " , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.
2. James M. Anderson and Edward M. Mikhail, " Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1985.
3. Wolf P.R. " Elements of Photogrammetry", McGraw Hill Book Company, New Delhi,1988

BCE302 STRUCTURAL ANALYSIS II **3 1 0 4**

1. ARCHES **12**

Arches structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects

2. SUSPENSION BRIDGES **12**

Analysis of suspension bridges – Un stiffened cables and cables with three hinged stiffening girders – Influence lines for three hinged stiffening girders.

3. SPACE STRUCTURES **12**

Introduction to analysis of space trusses using method of tension coefficients – Beams curved in plan.

4. PLASTIC ANALYSIS OF STRUCTURES **12**

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

5. MULTISTOREY FRAMES **12**

Introduction - Analysis of multistorey frames - Approximate methods - Substitute frame method - Portal method - Cantilever method - Factor method

Total = 60

Text Books

1. Vazirani V.N & Ratwani, "Analysis of structures" Khanna publishers , Delhi
2. G.S Pandit & S.P Gupta, Structural analysis –A Matrix Approach-Tata McGraw Hill.1997, New Delhi,
3. Matrix analysis of framed structures – William Weaver, Jr & James M.Gere, CBS Publishers & Distributors, Delhi, 1995
4. Bhavikatti S.S Structural Analysis Vol 1 and vol.2 ,Vikas Publishing House Pvt Ltd New Delhi

References:

1. Manicka Selvam V.K.,Elementary Matrix Analysis of Structures, Khanna Publishers,Mumbai,1990.
2. Coates R.C., Coutie M.G. and Kong F.K., Structural Analysis, ELBS and Nelson, Newjersey,1990

BCE318 DESIGN OF CONCRETE STRUCTURES 3 1 0 4

1. METHODS OF DESIGN OF CONCRETE STRUCTURES **12**

Concept of elastic method, ultimate load method and limit state method- advantages of limit state method over other methods-design codes and specification-limit state philosophy as detailed in current IS code.

2. LIMIT STATE DESIGN FOR BEAMS AND SLABS **12**

Design of singly and doubly reinforced rectangular and flanged beams. one way and two way slabs – rectangular slab subjected to uniformly distributed and concentrated loads – boundary conditions and corner effects .

3. LIMIT STATE DESIGN FOR SHEAR TORSION BOND AND ANCHORAGE **12**

Behavior of RC beams in shear and torsion-shear and torsion reinforcement-limit state design of R C members for combined bending shear and torsion- use of design aids

4. LIMIT STATE DESIGN OF COLUMNS **12**

Types of columns-analysis and design of short columns for axial UN axial and bi axial bending-design of long columns- use of design aids

5. LIMIT STATE DESIGN OF FOOTINGS **12**

Design of wall footings- Design Of Axially and Eccentrically loaded Rectangular footings-Design of Combined Rectangular footings for Two Columns Only. Design of raft.

Total =60

Text Books

1. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hall of India, Private, Limited New Delhi, 1997
2. Dayaratnam P, Brick and Reinforced Brick Structures, Oxford & IBH Publishing Company Private Limited, New Delhi, 1997

References:

1. Ashok K. Jain Reinforced concrete- Limit state design- New chand & Bros, Roorkee 1997.
2. Mallick and Gupta, Reinforced Concrete Design, Oxford and IBH, Delhi, 1997
3. Design Aids to IS 456-1978 (SP-16)
4. Code of Practice for Plain and Reinforced Concrete – IS456-2000

BCE306 TRANSPORTATION ENGINEERING II 3 0 0 3

1. PLANNING AND DESIGN FOR RAILWAY **9**

Role of Indian Railways in National Development. Engineering Survey for Track Alignment. Permanent Way, its Components and Functions of Each Component, Gauges in Railway Tracks. Coning of Wheels. Geometric Design of Railway Tracks – Gradient, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Vertical Curves and Grade Compensation (Derivations of formulae and Problems)

2. CONSTRUCTION, MAINTENANCE AND OPERATION TRACKS **9**

Points and Crossings, Signaling, Interlocking and Track Circuiting, Construction and Maintenance – Conventional and Modern methods (Remote Sensing, GIS & GPS) for Railway Alignment, Track Construction, Maintenance and Materials - Track Drainage. Lay outs of Railway Stations and Yards

3. AIRPORT PLANNING AND DESIGN **9**

Airport Planning, Components of Airports, Airport Site Selection Runway Design- Orientation, Geometric Design and Correction for Gradients Terminal area, Airport Layout, Airport Buildings, Passenger Facilities, Parking Area and Airport Zoning

4. HARBOUR ENGINEERING & OTHER MODES OF TRANSPORT **9**

Definition of Terms - Harbors, Ports, Docks, Tides and Waves. Harbors – Requirements, Classification – Site Investigation for Locations, Planning and Layouts Concept of Satellite Ports. Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories,

Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping, Inland Water Transport and Container Transportation. Pipe Ways, Rope Ways

5. ECONOMIC EVALUATION OF TRANSPORT PROJECTS **9**

Evaluation of Highway and Railway Projects- Cost Benefit Analysis (Benefit Cost Ratio, Net Present Value, International Rate of Returns (Problems) Environmental Impact Assessment, Financial Appraisal Build, Operate and Transfer for Highway and Railway Projects (Basic Concepts only)

Total = 45

Text Books:

1. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 1998.
2. Khanna S K, Arora M G and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994.

References:

1. Rangwala, Railway Engineering, Charotar Publishing House,Mumbai, 1995.
2. Rangwala, Airport Engineering, Charotar Publishing House,Mumbai, 1996.
3. Kadiyali L R, Principles and PractiCE of Highway Engineering, Khanna TechnicaPublication, Delhi, 1992

BCE320 ENVIRONMENTAL ENGINEERING II 3 0 0 3

1. WATER TREATMENT **12**

Identified Use & Quality of water source- Choosing the appropriate methodologies for treatment of surface and ground water -Physical Operations & Chemical (and other) Processes for surface water –Functions and design of Sedimentation tanks and Sand filters- Flash mixers, Clari-flocculators,– Various Disinfection choices & its suitability –Specific treatment requirements for Ground Water -Aeration – Iron and Manganese removal, Defluoridation and demineralization – Water softening-Advances in treatment Study of Drawings: Typical Process flow chart &layouts Sedimentation tanks and Sand filters- Flash mixers, Clari-flocculators

2. SEWAGE TREATMENT (ON –SITE & PRIMARY TREATMENT) **9**

On- site Septic tank &Soil dispersion system-Collection from Community -Physical Operations–Functions and design of Screen Chamber, Grit chamber and sedimentation tanks. Study of Drawings: Typical Process flow chart & layouts Screen Chamber – Grit chamber –Sedimentation tanks Septic tank – Soil dispersion system

3. SEWAGE TREATMENT – SECONDARY TREATMENT **12**

Secondary Treatment – Activated Sludge Process and Trickling filter; Other treatment methods, Oxidation Ditch, Upflow Anaerobic Sludge Blanket Reactor – Stabilization Ponds and– Advances in Sewage Treatment. Study of Drawings: Trickling filter Activated sludge plant Waste stabilization pond Oxidation Ditch Upflow Anaerobic Sludge Blanket Reactor

4. SEWAGE DISPOSAL AND SLUDGE MANAGEMENT **12**

Methods for disposal of Raw sewage (in limited strength & quantity) Septage from septic tank and effuent– Dilution – Self purification of surface water bodies – Oxygen sag curve – Land disposal – Sewage farming – Deep well injection.-Sludge Thickening – Sludge digestion – Biogas recovery - Drying beds – Conditioning and Dewatering – Sludge disposal advances in Sludge Treatment Study of Drawings: Sludge drying bed.

Total :45

Text Books:

1. Garg S.K., Environmental Engineering, Vols.I & II, Khanna Publishers, New Delhi, 1994
2. C.S.Shah, Water Supply and Sanitation, Galgotia Publishing Company, New Delhi, 1994.

Reference:

1. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993.
3. H.S.Peavy, D.R.Rowe and George Tchobanoglous, Environmental Engineering, McGraw-Hill Company, New Delhi, 1995.

BCE322 FOUNDATION ENGINEERING 3 1 0 4

1. SOIL EXPLORATION **12**

Scope and objectives – Method of exploration – angering and boring – Wash Boring and rotary drilling – Depth of boring – spacing of bore hole - Sampling –Representative and undisturbed - sampling – sampling techniques –Split Spoon Sampler,Thin tube sampler,stationary piston sampler - Bore log and report – Penetration tests (SPT and SCPT) – Data interpretation – Selection of foundation based on soil condition.

2. SHALLOW FOUNDATION **12**

Introduction – Location and depth of foundation – codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's Formula and BIS Formula – factors affecting bearing capacity – problems- bearing capacity from in situ tests(SPT, SCPT and plate load) allowable bearing pressure – sesmic consideration in bearing capacity,settlement – Components of settlement – Determination of settlement of foundation on granular and clay deposit – Total and differential settlement – allowable settlement -– Codal provisions – Methods of minimizing settlements.

3. FOOTINGS AND RAFTS **12**

Types of foundation – Contact pressure Distribution below footings and raft – Isolated footing – design – combined footings – Types and Proportioning –Mat foundation-Types- Applications-proportioning- Floating Foundation – Sesmic Design of foundation – Codal provisions.

4. PILE FOUNDATION **12**

Types of piles and their Function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soils – Static formulae - dynamic formulae (Engineering News and Hiley's) – Capacity from insitu tests (SPT and SCPT) – Negative Skin friction - uplift Capacity – Group capacity by Different methods(Feld's rule,converse-labarra formula and Block Failure criterion) – Settlement of pile groups – Interpretation of pile load test(Routine test only) – Forces on pile caps – under reamed piles – Capacity under compression and uplift .

5. RETAINING WALLS **12**

Plastic equilibrium in soils – active and passive states – Rankine's theory – Cohesionless and cohesive soil - Coloumb's wedge theory – Condition for critical failure plane - Earth pressure on retaining walls of simple configurations – Graphical methods (Rebhann and Culmann's method) - Pressure on the wall due to line load –– Stability analysis of retaining walls.

Total =60

Text Books:

1. Arora, K.R. Soil mechanics and foundation engineering, standard publishers and distributors, New Delhi, 1997.
2. Gopal Ranjan and Rao, A.S.R. Basic and applied soil mechanics, Wiley Eastern Ltd., New Delhi (India), 1997.
3. V.N.S. Moorthy, " Soil Mechanics and Foundation Engineering ", UBS Publications and Distribution Ltd, New Delhi, 1999.

References:

1.Bowles J.E. Foundation analysis and design, McGraw Hill, 1994.
2.Dass , B.M , "Principles of geotechnical engineering", Thompson books, Singapore ,5th edition, 2003
3.Kaniraj , S.R," Design Aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill Publishing company Ltd , New Delhi
4.Swamisaran, " Analysis and Design of Structures – Limit State Design", Oxford IBH Publishing Co Pvt .Ltd. New Delhi , 1998

BCE312 COMPUTER AIDED BUILDING DRAWING 0 0 2 1

Building drawing in accordance with development and control rules satisfying orientation and functional requirements for the following :

1) Residential buildings with load bearing walls (RCC roof) **6**
2) RCC framed structures **6**
3) Office buildings (RCC roof) **6**
4) Industrial buildings, North light roof structures, Trusses, Gantry arrangements **6**
5) Perspective view for small buildings **6**

Total = 30

Text Books:

1. Civil Engg. Drawing & House planning – B.P.Verma, Khanna publishers, Delhi,1990
2. Building drawing & detailing – Dr. Balagopal & T.S.Prabhu, Spades publishers, Calicut,1989.

References:

1. Building drawing – Shah, Tata McGraw-Hill, New Delhi,2000.
2. Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotar publishing house.Mumbai,1997.
3. Shah, Kale and Patki, Building drawing, Tata McGraw-Hill New Delhi,,1998.

BCE314 ENVIRONMENTAL ENGINEERING LABORATORY 0 0 2 1

LIST OF EXPERIMENTS

1. **a)** Determine of pH.
   b) Determination of Turbidity.
2. Determination of Hardness.
3. Determination of Alkalinity.
4. Determination of Residual Chlorine.
5. Estimation of Chlorides.
6. Estimation of Ammonia Nitrogen.
7. Estimation of Sulphate.
8. Determination of optimum coagulant dose.
9. Determination of specific conductivity.
10. Estimation of available chlorine in Bleaching Powder.
11. Determination of dissolved Oxygen.
12. Determination of suspended settleable, volatile and fixed solids.]
13. B.O.D. Test.
14. C.O.D. Test.

Total = 30

Reference books:

1. Trivedi and Goel – Chemical and biological methods for water pollution studies. New Delhi,2000.
2. A course Manual – Water and wastewater analysis. National Environmental Engineering Research Institute. Nagpur – publication.
3. Standard Methods for Examination of water and Waste water APHa, AWWA and WPCF, 1985 Edition.

BCE316 SURVEY CAMP* 0 0 3 1

1. Three weeks survey camp using Theodolite, cross staff, leveling staff, tapes and Plane table
   (i) Triangulation
   (ii) Trilateration
   (iii) Star observation to determine azimuth
   (iv) Rectangulation

* Will be accommodated during preceding winter vacation **Total :30**

References:

1. Bannister A. and Raymond S., " Surveying " , ELBS,Pune, Sixth Edition, 1992.
2. Heribert Kahmen and Wolfgang Faig, " Surverying " , Walter de Gruyter, 1995.
3. Kanetkar T.P., " Surveying and Levelling " , Vols. I and II, United Book Corporation, Pune, 1994.
4. Punmia B.C., " Surveying ", Vols. I, II and III, Laxmi Publications, New Delhi, 1999.
5. Clark D., " Plane and Geodetic Surveying " , Vols. I and II, C.B.S. Publishers and Distributors, Delhi, sixth Edition, 1971.
6. James M. Anderson and Edward M. Mikhail, " Introduction to Surveying ", McGraw Hill Book Company, New Delhi, 1985.
7. Wolf P.R. " Elements of Photogrammetry", McGraw Hill Book Company, New Delhi,1988

BCE401 ESTIMATION AND QUANTITY SURVEYING 3 0 0 3

1. ESTIMATION **9**

Types of Estimates- Units of measurements-Methods of Estimates – Advantages - Estimation of load bearing and framed structures – calculation of quantities of Brick work, RCC, PCC, White Washing ,color washing and painting / varnishing – calculation of brick work and RCC works in arches – Estimate of joineries for paneled and glazed doors ,windows, ventilators, handrails etc.- estimation of septic tank ,soak pit- estimate of bituminous and cement concrete roads

2. SPECIFICATIONS AND TENDERS **9**

Data –Schedule of rates- Analysis of rates-Specifications-Sources-Detailed and general specifications – Tenders- Contracts- Type of contracts – Arbitration and legal requirements

3. VALUATION **9**

Necessity – Basics of value Engineering –Capitalized value – Depreciation – Escalation _ Value of Building – Calculation of Standard rent – Mortgage - Lease.

4. REPORT OF PREPARATION **9**

Principles of Report of preparation – report on estimate of Residential building- Culvert – Roads – Water supply and Sanitary installations – Tube wells – Open Wells.

5. CASH FLOW AND COST CONTROL **9**

Cash flow – cash inflow – outflow-cost control –tools and techniques – cost control in construction project – exercise on cash flow in Civil engineering projects.

TOTAL : 45

Text Books:

1. Estimating and costing in civil Engineering – B.N.Dutta, S.Dutta & Company, Lucknow,1997.
2. Practical valuation – Vol I Mr. B.Kanagasabapathy, M/s. Ehilalarasi Kanagasabapathy, Thiruchirappalli,1995.

References:

1. A text book on estimating and costing – G.S.Birdie – Dhanpat Rai and Sons, New Delhi,1995.
2. Fixation of fair rent - Mr. B.Kanagasabapathy, M/s. Ehilalarasi Kanagasabapathy, Thiruchirappalli,1995.
3. Jagannathan G, Getting more at less less cost – The Value Engineering Way, Tata McGraw Hill, New Delhi, 1992.

BCE403 DESIGN OF CONCRETE AND MASONRY STRUCTURES **3 1 0 4**

1. RETAINING WALLS **12**

Design of Cantilever and Counter fort Types.

2. SELECTED TOPICS **12**

Design Of Staircases (ordinary and dog-legged)-Design of flat slabs-Road bridges

3 WATER TANKS **12**

Design of under Ground Rectangular Tanks –Domes- Design of Overhead Circular and Rectangular Tanks – Design of staging and foundations

4. YIELD LINE THEORY **12**

Application of virtual work method to square, rectangular, circular and triangular slabs

5. BRICK MASONRY **12**

Design of masonry walls, pillars and footings as per NBC and I.S.codes.

Total =60

Text Books

1. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hall of India, Private, Limited New Delhi, 1997
2. Krishna Raju N. Design of RC structures, CBS Publishers and distributers, New Delhi,1995.
3. Dayarathnam.P, Brick and Reinforced Brick Structures, Oxford and IBH Publishing House,1999.

References:

1. Mallick and Gupta, Reinforced Concrete Design, Oxford and IBH, Delhi, 1997
2. Design Aides to IS 456-1978 (SP-16)
3. Code of Practice for Plain and Reinforced Concrete – IS456-2000

BCE405 PRE STRESSED CONCRETE STRUCTURES **3 1 0 4**

1. INTRODUCTION – THEORY AND BEHAVIOUR **12**

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect on tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width

2. DESIGN **12**

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications.

3. CIRCULAR PRESTRESSING **12**

Design of prestressed concrete tanks – Poles and sleepers

4. COMPOSITE CONSTRUCTION **12**

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members

5. PRE-STRESSED CONCRETE BRIDGES **12**

General aspects – pretension prestressed bridge decks – Post tensioned prestressed bridge decks – Advantages over R.C. bridges – Principles of design only

Total =60

Text Books:

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi 1998
2. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH publishing Co.Pvt. Ltd. 1997.

References:

1. Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi, 1990
2. Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995.
3. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete – A design guide, McGraw Hill, New Delhi 1992.

BCE407 CONSTRUCTION MANAGEMENT 3 1 0 4

1. CONSTRUCTION PLANNING 12

Basic concepts in the development of construction plan – Choice of technology and construction method – Defining work tasks – Definition – Precedence relationships among activities – Estimating activity duration – Estimating resource requirements for work activities .

2. APPLICATION OF PERT AND CPM IN CONSTRUCTION MANAGEMENT 12

Introduction – Advantages of network analysis – Activity and Event oriented network - calculation of Critical path scheduling
Comparison between PERT and CPM –Activity Float and Schedules – Crashing and time cost trade offs – Improving the scheduling process.

3. COST CONTROL MONITORING AND ACCOUNTING 12

Cost Control **- P**roject appraisal **– C**oncept of pay back period – Financial accounting system and Cost accounts – Control of project cash flows - schedule and budget updates

4.QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 12

Importance of quality and safety – Organizing for quality and safety – Safety measures – Prevention of fire at construction site – Elements of quality – Organization of quality control – Quality assurance techniques

5. MANAGEMENT INFORMATION SYSTEM IN CONSTRUCTION INDUSTRY 12

Definition of MIS – Requirements of MIS – Data base approach – Benefits of database and application programs - Types of project information – Accuracy and use of information.

Total =60

Text Books

1.Chitkara, K.K "Consruction Project Management Planning "Scheduling and Control, Tata McGraw – Hill Publishing Co., NEWDELHI, 1998.
2. **S. Seetharaman** - Construction Engineering & Management ,Dhanpat rai publications ,Pune,1995.

Referefces:

1.Construction Management - Sangareddy And Meyyappan,Prathibha publications,CBE,1994.
2.MODER. J., C. PHILLIPS AND DAVIS, "Project Management with CPM, PERT AND Precedence Diagramming,1999.
3**.** Prasanna Chandra, " Project Management ", TMH ,New Delhi,1997.

BCE409 STRUCTURAL ANALYSIS AND DESIGN LAB 0 0 2 1

1. Analysis and design of beams.
2. Analysis and design of slabs.
3. Analysis and design of columns.
4. Analysis and design of footings.
5. Analysis and design of retaining walls.
6. Analysis and design of trusses.
7. Analysis of 2d frames and 3d frames
8. Analysis and design of water tanks

Total = 30

Text Book:

1. Structural design and drawing (concrete and steel- vol 2 and vol 3)- Krishnaraju, CBS publishers 1995
2. Design Of Steel Structures- B.C.Punmia, Ashok kumar jain,Arun kumar Jain ,Lakshmi publications pvt ltd, 1999.

Reference :

1. Krishnamoorthy D- Structural Desing and drawing vol II CBS Publishers and distributors Delhi 1990.
2. Krishnamoorthy D- Structural Desing and drawing vol III (steel structures) CBS Publishers and distributors Delhi 1990.

BCE411 TRANSPORTATION ENGINEERING LAB 0 0 2 1

1. CBR Test of Given soil sample.
2. Grading Of aggregates.
3. Water Absorption Test on aggregates
4. Abrasion test on aggregates.
5. Impact Test On aggregates
6. Bitumen tests
7. Benklemann Beam apparatus.

Total = 30

BCE402 STRUCTURAL DYNAMICS AND EARTH QUAKE ENGINEERING 3 1 0 4

1. SINGLE DEGREE OF FREEDOM SYSTEMS 12

Formulation of equation of motion-free and forced vibrations-response to dynamic Loading-effect of damping

2. MODAL ANALYSIS 12

Free and forced vibration of undamped and damped MDOF systems- equation of Motions- evaluation of natural frequencies and modes

3. INTRODUCTION TO EARTH QUAKE ENGINEERING 12

Elements of engineering seismology- characteristics of earth quake engineering- earth quake history- Indian seismicity

4. BEHAVIOUR OF STRUCTURES AND SOIL 12

Performance of structures under past earth quakes- lessons learnt from past earth Quakes- behaviour of soil under earth quake loading- soil liquefaction- soil structure Interaction effects

5. EARTH QUAKE RESISTANT DESIGN **12**

Concept of Earth quake resistant design- provisions of seismic code IS-1893 (part I)- 2002- response spectrum- design spectrum- seismic coefficient- design of buildings.

Total =60

Text books

Clough R. W, and Penzien J, Dynamics of structures, Second Edition, Mc Graw- Hill International edition,New Delhi, 1993

Mario Paz, structural dynamics- theory and computations, Third Editions CBS Publishers,New Delhi, 1990.

Reference

Minoru Wakabayashi, Design of earth quake resistant buildings,Mc Graw- Hill book company, New York 1986

Anil K Chopra, Dynamics Of Structures- Theory and applications to Earth quake engineering, Prentice hall inc, 2001

BCE404 PROFESSIONAL ETHICS **3 0 0 3**

1. ENGINEERING ETHICS **9**

Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas. Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues – Theories about right action – Self-interest – Customs and religion – Use of Ethical Theories

2. ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as experimentation – Engineers as responsible experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study.

3. ENGINEER'S RESPONSIBILITY FOR SAFETY **9**

Safety and risk – Assessment of safety and risk – Risk Benefit Analysis – Reducing risk – The Three Mile Island and Chernobyl Case Studies

4. RESPONSIBILITIES AND RIGHTS **9**

Collegiality and loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Discrimination.

5. GLOBAL ISSUES **9**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample code of conduct.

TOTAL : 45

Text Books:

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York, 1996
2. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 1999

References:

1. Laura Schlesinger, How Could You Do That: The Abdication of Character, Courage, and ConscienCE, Harper Collins, New York, 1996.
2. Stephen Carter, Integrity, Basic Books, New York 1996.
3. Tom Rusk, The Power of Ethical Persuasion: From Conflict to Partnership at Work and in Private Life, Viking, New York, 1993

BCE406 TOTAL OUALITY MANAGEMENT **3 0 0 3**

1. INTRODUCTION **9**

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – concepts, Role of Senior Management. Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barries to TQM Implementation.

2. TQM PRINCIPLES **9**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, Sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

3. STATISTICAL PROCESS CONTROL (SPC) **9**

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for Variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

4. TQM TOOLS **9**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

5. QUALITY SYSTYEMS **9**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits.

Total :45

Text Book:

1. Dale H. Besterfiled, et at., Total Quality Management, Pearson Education Asia, 1999. (Indian reprint 2002).

Reference Book:

1. James R. Evans & William M.Sidsay, The Management and Control of Quality, (5th Edition), South – Western (Thomson Learning), 2002 (ISBN 0 – 324 – 06680 – 5)
2. Feigenbaum.A.v. "Total Quality Management, McGraw – Hill, 1991.

3. Oakland.J.s. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.

BCE408 PROJECT WORK 0 0 16 8

The Objective of project work is to enable the students to work in convenient groups of not more than four members in a group on a project involving theoretical and experimental studies related to Civil Engineering. Every Project Work shall have a Guide who is a member of the faculty of the University. Twelve periods per week shall be allotted in the Time Table for this important activity and this time shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis or field work as assigned by the Guide and also to present in periodical seminars the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature Survey, problem statement, Project work details and conclusions. This final report shall be typewritten form as specified in the guidelines. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time.

ELECTIVES

BCEE02 / BCE 001 GROUND WATER ENGINEERING 3 0 0 3

1. FUNDAMENTALS OF GROUND WATER **9**

Introduction – Characteristic of Ground water – Global distribution of water - ground water column –Permeability - Darcy's Law - Laboratory permeability test - Types of aquifers - Hydro geological Cycle – water level fluctuations.

2. HYDRAULICS OF FLOW **9**

Storage coefficient - Specific yield - Heterogeneity and Anisotropy -Transmissivity - governing equations of ground water flow - Steady state flow – Du puit Forchheimer assumption - Velocity potential - Flow nets.

3. ESTIMATION OF PARAMETERS **9**

Transmissivity and Storability – Pumping test - Unsteady state flow - Thiess method - Jacob method - Image well theory – Effect of partial penetrations of wells - Collectors wells.

4. GROUND WATER DEVELOPMENT **9**

Collector wells - Infiltration gallery - Conjunctive use - Artificial recharge -Safe yield -Yield test – Geophysical methods – Selection of pumps.

5. WATER QULAITY **9**

Ground water chemistry -Origin, movement and quality - Water quality standards - Saltwater intrusion –Environmental concern.

Total No of Periods : 45

Text books:

1. Raghunath H.M., Ground Water Hydrology, Wiley Eastern Ltd., Second reprint, 2000. New Jersi
2. Todd D.K., Ground Water Hydrology, John Wiley and Sons, 2000. New Jersi

References:

1. Ramakrishnan S, Ground Water, 1998, McGraw Hill New Delhi
2. C Walton, Ground Water Resource Evaluation, McGraw Hill, New Delhi

BCEE04 / BCE 002 WATER RESOURCES ENGINEERING 3 0 0 3

1. GENERAL **9**

Water Resources Survey - Water ResourceS of India and Tamilnadu - Description of Water Resources Planning - Economics of W.R.Planning - Physical and Socio - economic data - National water Policy - Tamil nadu State Water Policy - Collection of meteorological and hydrological data for water resources development.

2. NETWORK DESIGN **9**

Hydrologic measurement – Analysis of hydrologic data - Hydrologic station network - Station network design - Statistical techniques in network design.

3. WATER RESOURCE NEEDS **9**

Consumptive and non-consuptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan.

4. RESERVOIR PLANNING AND MANAGEMENT **9**

Reservoir - Single and multipurpose - Multiobjective - Fixation of Storage capacity -Strategies for reservoir operation - Sedimentation of reservoirs - Design flood - Levees and flood walls - Channel improvement.

5. ECONOMIC ANALYSIS **9**

Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors - Discounting techniques – Computer Application.

Total No of Periods : 45

Textbooks:

1. Linsley R.K. and Franzini J.B, Water Resources Engineering, McGraw Hill Inc, 2000. New Delhi
2. Douglas J.L. and Lee R.R., Economics of Water Resources Planning, Tata McGraw Hill Inc.2000. New Delhi

References:

1. Chaturvedi M.C., Water Resources Systems Planning and Management, Tata McGraw Hill Inc., New Delhi, 1997.

2. Goodman Alvin S., Principles of Water Resources Planning, Prentice-Hall, 1984. New Delhi
3. Maass et al. Design of Water Resources Systems, Macmillan, 1968. New Delhi

BCEE06 / BCE 003 COASTAL ZONE MANAGEMENT 3 0 0 3

1. COASTAL OCEANS **9**

Introduction and Basic concepts – Coastal Waters, Estuaries, Wetlands and lagoons – Pollution Stresses on Coastal water – Marine sediments – Sediment transport – Texture, composition and distribution – Living resources in the coastal zone and their conservation and utilization – Non-living resources and their exploration and exploitation.

2. WAVE DYNAMICS **9**

Wave characteristics – Airy's Linear Wave Theory – Deep water waves – Shallow water waves – Transitional waves – Wind generated waves – Sea swell – Surface-wave refraction – Wave reflection – Wave breaking – Storm surge – Tsunami – Internal waves.

3. COASTAL PROCESSES **9**

Erosion and depositional shore features – change levels of the shoreline – plate tectonics and coasts – Tides and currents – Littoral currents – Renewable ocean energy – Shifting river mouths and delta formation shoreline shifting and need for continuous survey – ocean thermal energy conversion – Wave-tidal engineering structures and other infrastructure in coastal zone – Dykes and Levees.

4. ENVIRONMENTAL IMPACTS IN COASTAL ZONE **9**

Hydraulic aspects – Ecological aspects – Land use in coastal zone – Coastal aquifers – Sea water intrusion – Desalination – Brackishwater aquaculture and its impact on coastal zone – Coastal zone management – Concepts and development – Data base for coastal zone management – Design and operation of closure works – Sand closure.

5. GIS AND REMOTE SENSING APPLICATION **9**

Introduction and basic concepts of GIS – Data entry storage and analysis and modeling – Application in coastal zone – Aquaculture remote sensing – Basic concepts – Application of remote sensing in coastal zone management.

Total No of Periods : 45

Text Books:

1. Ippen, Arthur and T. Estuary, Coastline Hydrodynamics, McGraw Hill, New , New York, 1993
2. Dwivedi S. N., Natarajan R and Ramachandran S, Coastal Zone Management in Tamilnadu, 1991

BCEE08 / BCE 004 HYDROLOGY 3 0 0 3

1. HYDROMETEOROLOGY **9**

Hydrological cycle – Hydro meteorological factors – Cloud formation – Winds and their movement – Types of precipitation – Forms for precipitation – Density and Adequacy of rain gauges – Recording and non-recording gauges.

2. PRECIPITATION AND ABSTRACTIONS **9**

Spatial distribution – Consistency analysis – Frequency analysis – Intensity, duration, frequency relationships – Evaporation – Infiltration – Horton's equation – Infiltration indices – Types of streams – Stage discharge relationships – Flow measurements – Current meter method for velocity measurements.

3. HYDROGRAPH ANALISYS **9**

Factors affecting shape of hydrograph – Components of DRH – Baseflow – Unit hydrograph – S curve hydrograph – Synthetic unit hydrograph.

4. GROUND WATER HYDROLOGY **9**

Occurrence of ground water – Types of aquifer – Dupuit's assumptions – Darcy's law – Estimation of aquifer parameters – Pump tests.

5. FLOOD ANALYSIS **9**

Flood estimation – Gumbel's method – Log Pearson type III method – Reservoir flood routing – Channel routing – Other methods of routing.

Total No of Periods : 45

Text Books:

1. Subramanya K, Engineering Hydrology, Tata McGraw-Hill, 1999.
2. Jayaram Reddy P, Hydrology, Tata McGraw-Hill, 1998.

References:

1. Raghunath H M, Hydrology, Wiley Eastern Limited, 1998.
2. Vijay P Singh, Elementary Hydrology, Prentice Hall of India, 1998.
3. Mutreja K N, Applied Hydrology, Tata McGraw Hill, 1998.

BCEE10 / BCE 005 IRRIGATION ENGINEERING 3 0 0 3

1. IRRIGATION AS A SCIENCE **9**

Definition – Need – Benefits – Historical Development. Scope in the country and the state. Sources for irrigation, wells, springs, rivers, streams, tanks, reservoirs. Flow and Lift irrigation. Methods of flow irrigation. Devices and equipments for lift irrigation. Duty, different concepts of duty and factors affecting duty.

2. CROP WATER REQUIREMENTS **9**

Soil – plant – water relationship. Evapotranspiration – consumptive use. Perennial, Annual and Seasonal crops. Principal irrigated wet and irrigated dry crops. Assessment of crop water requirements. Effective rainfall. Net irrigation requirements for principal crops. Irrigation water quality. Salt resistant crops. Water logging, remedial measures.

3. CONVEYANCE AND DISTRIBUTION OF IRRIGATION WATER **9**

Head works – Diversion and storage structures. Canals unlined and lined. Canal alignments, contour ridge. Branch canals, minors, water course and filed bothies. Control structures, drops, escapes, shutters and operating deviCEs, division boxes. Cross drainage structures, undertunnels, aqueducts, siphons, siphon adueducts. Cross masonry structures, road and railway bridges.

4. IRRIGATION WATER MANAGEMENT **9**

Need for optimization of water use. Management and productivity. Minimising irrigation water losses. Operational rules for regulation. Physical structures for management, on farm development works. Participatory Irrigation Management (PIM). Water Users Associations (WUA). Training the water users.

5. DESIGN AND DRAWING OF IRRIGATION STRUCTURES **9**

Sluices and surplus weirs in tanks. Earthdam section, homogenous and zoned. Anicuts and river weirs on solid and permeable foundation. Head regulators, canal drops, canal syphones and aqueducts – undertunnels. Simple design of masonry and earthdams. Design channels. Computer aided designs.

Total No of Periods : 45

Text Books:

1. Sharma R.K., Irrigation Engineering and Hydraulic Structures, Oxford and IBH Publishing Company, New Delhi, 2002.
2. Sathyanarayana Murthy, Irrigation Design and Drawing, Published by Mrs.L.Banumathi, Tuni, Eas Godavari District, A.P. 1998.

Reference:

1. Michael A.M., Irrigation – Theory and PractiCE, Vikas Publishing House, 2000
2. Hand Book on Irrigation System Operation PractiCEs, Water ResourCEs Management and Training Project Technical Report No.33, CWC, Delhi, 1990
3. Hand Book for improving Irrigation System MaintenanCE PractiCEs, Water Management and Training Project Technical Report No.19A, CWC, Delhi, 1989

BCEE01 / BCE 006 TRANSPORTATION PLANNING AND SYSTEMS 3 0 0 3

1. STUDY AREA AND SURVEYS **9**

Importance of planning for Integrated transport facilites in urban areas- Delineation of study area and zoning –Conducting various surveys - Travel patterns , Transport facilites and planning parameters.

2. MODES **9**

Basic of trip generation -Trip distribution - Trip assignment and modal split models -Validation of the model.

3. PLAN PREPARATION AND EVALUTION **9**

Preparation of alternative plans - Evaluation techniques - Economic and financial evalution – Environment Impact Assessment (EIA) - Case Studies.

4. BUS TRANSPORTATION **9**

Characteristics of bus transportation in urban areas - Fare policy -Route planning - Planning of terminals –Break even point and its relevance.

5. RAIL TRANSPROTATION **9**

Characteristics of suburban, LRT and RRT systems - Planning of rail terminals -Fare policy -Unified traffic and transport authority.

Total No of Periods : 45

Text Books:

1. Michael J. Bruton "Introduction to Transportation Planning ", Hutchinson, London, 1995.
2. Kadiyali L.R., "Traffic Engineering and Transport Planning ", Khanna Publishers, Delhi, 1997.

References:

1. John W.Dickey, Metropolitan Transportation Planning, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1990.
2. Comprehensive Traffic and Transportation Studies for Madras Metropolitan Development Area, Madras Metropolitan Development Authority 1995.

BCEE03 / BCE 007 TRAFFIC ENGINEERING AND MANAGEMENT 3 0 0 3

1. INTRODUCTION **9**

Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering- Road, Traffic and Land Use Characteristics.

2. TRAFFIC SURVEYS AND ANALYSIS **9**

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services- Problems.

3. TRAFFIC CONTROL **9**

Traffic Signs, Road Markings, Design of Traffic Signals and Signal Co-ordination (Problems), Traffic control Aids and Street Furniture, Computer Applications in Signal Design.

4. DESIGN OF GEOMETRIC INTERSECTIONS **9**

Conflicts at Intersections, Classification of Intersections at Grade, Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Channelisation and Rotary Design (Problem).

5. TRAFFIC MANAGEMENT **9**

Traffic Management- Traffic System Management (TSM) and Travel Demand Management (TDM), Restrictions on Turning Movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal Flow Operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS).

Total No of Periods : 45

Text Books:

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 200.
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna Technical Publications, Delhi, 200.

References:

1. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
2. Guidelines of Ministry of Road Transport and Highways, Government of India.
3. Subhasg C.Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.

BCEE05 / BCE 008 HOUSING – PLANNING AND DESIGN 3 0 0 3

1. INTRODUCTION TO HOUSING 9

Definition of Basic Terms – House, Home, Household, Apartments - Objectives of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Local bodies' Bye-laws at Urban and Rural Level and Development Control Regulations, Institutions for Housing at National, State and Local levels.

2. HOUSING PROGRAMMES 9

Basic Concepts – Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programme, Role of Public, Private and Non-Government Organisations.

3. PLANNING AND DESIGN OF HOUSING PROJECTS 9

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (Design Problems).

4. CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation.

5. HOUSING FINANCE AND PROJECT APPRAISAL 9

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing o f Housing Units, Rents, Recovery Pattern (Problems).

Total No of Periods : 45

Text Books:

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

References:

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 200.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994.
3. National Housing Policy, 1994, Government of India.

BCEE07 / BCE 009 RAILWAYS AND AIRPORT ENGINEERING 3 0 0 3

1. CONSTRUCTION AND MAINTENANCE OF RAILWAY TRACKS 9

Railway Track Design - Construction, Formation, Earthwork Consolidation, Plate Laying, Sleepers, Materials, Sleeper Density – Ballast, Materials, Size and Quantity, Laying of Ballast – Maintenance of Railway Tracks, Methods, Important Considerations – Modern Methods and Materials for Construction and Maintenance

2. DESIGN AND CONSTRUCTION OF RAILWAY BRIDGES 9

General Requirements – Component of Bridges, Design of Bridges – Waterway, Afflux and Depth of Foundation, Scour, Economic Span – Problems

3. RAPID TRANSIT SYSTEM (RTS) 9

Alignment of Rapid Transit System (RTS) - Different types of RTS – Station Elements of RTS – Design aspects of LRT and RTS – Application of Remote Sensing, GIS Techniques in alignment

4. AIRPORT DESIGN ASPECTS 9

Planning and Design of Various Components of Airport – Runway (Wind Rose Diagram-Problem), Taxiway, Structural Design of Airport Pavements, Strengthening of Airfield Pavements, Terminal Buildings, Hanger.

5. MAINTENANCE AND REHABILITATION OF AIRFIELD PAVEMENTS 9

Need for Maintenance – Airfield Pavement – Failures, Maintenance and Rehabilitation of Airfield Pavements – Evaluation of Airfield Pavements – Strengthening of Airfield Pavements – Problems

Total No of Periods : 45

Text Books:

1. Saxena C Subhash and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 1999.
2. Khanna S K, Arora M and Jain S S, Airport Planning and Design, Nemchand and Brothers, Roorkee, 1994

References:

1. Rangwala, Railway Engineering, Charotar Publishing House, 1995.
2. Rangwala. Airport Engineering, Charotar Publishing House, 1996.
3. Agarwal M M, Indian Railway Track, Prabha and Co., New Delhi, 1993.

BCEE09 / BCE 010 GEOGRAPHICAL INFORMATION SYSTEM 3 0 0 3

1.INTRODUCTION 9

Maps – Definition – Types of Maps – Characteristics of Maps – Map Projections – GIS – Definition – Components of GIS – Hardware, Software and Organisational Context – GIS software.

2. DATA AND DATA INPUT **9**

Data Types – Spatial and Non-Spatial – Spatial Data – Points, Lines and Polygons – Non-spatial data – Nominal, Ordinal, Interval and Ratio – Digitizer – Scanner – Editing and Cleaning – Georeferencing.

3. DATA STRUCTURE AND ANALYSIS **9**

Raster and Vector Data Structure – Raster data storage – Run length, Chain and Block Coding – Vector Data Storage – Topology – Topological Models – ArcNode Structure – Surface Data – DEM – Gridded DEM and TIN structure- Applications of DEM.

4. DATA ANALYSIS AND DATA QUALITY **9**

Reclassification – Measurement – Buffering – Overlaying – SQL for Queries – Neighborhood and zonal operations – Data Quality – Components of data quality - Sources of errors in GIS – Meta data.

5. DATA OUTPUT AND GIS APPLICATIONS **9**

Output – Maps, Graphs, Charts, Plots, Reports – Printers – Plotters – Fields of application – Natural Resource Management, Parcel based, AM/FM applications examples – Case study: Urban growth studies using GIS

Total No of Periods : 45

Text Books:

1. Anji Reddy, Remote Sensing and Geographical Information Systems , BS Publications 200
2. M.G. Srinivas (Edited by), Remote Sensing Applications, Narosa Publishing House, 200.

References:

1. Burrough P.A., Principles of GIS for Land Resources Assessment, Oxford Publication.
2. Star J. and Estes. J., GIS – An Introduction, Prentice Hall, USA.
3. Robert Laurini and Derek Thompson, Fundamentals of Spatial Information Systems, Academic Press, 1996.

BCEE11 / BCE 011 CARTOGRAPHY 3 0 0 3

1. INTRODUCTION **9**

Cartography today - Nature of Cartography - History of Cartography - Graticules - Cartometry.

2. EARTH **9**

Earth - Map Relations - Basic Geodesy - Map Projections, Scale, Reference and Coordinate system –Transformation - Basic Transformation -Affin Transformation.

3. SOURCES OF DATA **9**

Sources of data - Ground Survey and Positioning - Remote Sensing data collection - Census and sampling –data - Models for digital cartographic information, Map digitizing.

4. PERCEPTION AND DESIGN **9**

Cartographic design - Color theory and models - Color and pattern creation and specification -Colot and pattern - Typography and lettering the map -Map compilation.

5. CARTOGRAPHY ABSTRACTION **9**

Selection and Generalisation Principles - Symbolisation - Topographic and thematic maps-Maps production and Reproduction - Map series.

Total No of Periods : 45

Text Books:

1. R.W. ANSON and F.J.ORMELING, Basic Cartography for students and Technicians. Vol.I, II and III, Elsevirr Applied Science Puplishers 2nd Edition, 1994.
2. Arthur, H.Robinson Et al Elements of Cartography, Sixth John Cambell, Introductory Cartography, Second Edition, John Wiley and Sons, 1995.

References:

1. John Cambell, Introductory Cartography Second Edition, 1994, Wm.C Brown Publishers.
2. R.P Misra and A. Ramesh, Fundamentals of Cartography, Concept Publishing Company, New Delhi -2.

BCEE13 / BCE 012 ELECTRONIC SURVEYING 3 0 0 3

1. BASICS **15**

Methods of measuring distance, historical development, basic principles, classifications, applications and comparision with conventional surveying. Fundamental of electronics, resonant circuits, semiconductors, Lasers, Cathode ray tube, photo multiplier tube, transducers, oscillators, frequency mixing, modulation and demodulation, Kerrcell modulator, measurement of phases difference, reflectors and power sources.

2. PROPAGATION OF ELECTROMAGNETIC WAVES **15**

Definition, classification, applications, Propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions, reference refractive index for microwaves, measurements of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction.

3. ELECTROMAGNETIC DISTANCE MEASURING SYSTEM **15**

Electro-optical system, measuring principle, working principle, sources of error, infrared EDM instruments, Laser EDM instruments and total station. Microwave system measuring principle, working principle, sources of error, microwave EDM instruments, comparision with Electro-optical system, care and maintenance of EDM instruments, Modern Positioning Systems.

Total No of Periods : 45

References

1. Burnside, C.D. Electromagnetic distance measurements Crosby Lock wood staples, U.K. 1991.
2. Rueger, J.M. Electronic Distance Measurements, Springer-Verlag Berlin, 1990.
3. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc., 1993.

4. Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement, Adam Hilger Ltd., 1997.

BITE31 / BCE 030 INFORMATION TECHNOLOGY 3 0 0 3

1. INTRODUCTION **9**

Data - information - Knowledge - Concepts of Database Design and Architecture - Commercial and Engineering Database.

2. COMPUTER HARDWARE AND SOFTWARE **9**

Mother Board - Memory Devices -Bus -Ports and peripherals - I/O Devices -PC and work stations-Foundations of Operating System and its level of abstraction -Compilers - Interrupt Services Application, Software -Elements of visual Programming - Concepts, Components and formats of Multimedia - Principles of Virtual Reality.

3. SOFTWARE ENGINEERING AND QUALITY CONTROL **9**

Introduction - Principles and Requirements - Planning -Cost Estimation -Design Concepts - Modularizations –Nation - Implementation - Verification -Maintenance - Software quality management, ISO and CMM.

4. NETWORKS AND COMMUNICATION **9**

Introduction to Computer Networks - Layered Architecture - Data Communication Concepts – Transmission Media and Topologies - Internetworking issues - Internet - TCP/IP Protocols and WWW.

5. APPLICAITION OF INFORMATION TECHNOLOGY IN CIVIL ENGINEERING **9**

IT applications in Design, Construction management, Environmental monitoring water resources Management and urban planning and Design.

Total No of Periods : 45

Text Books:

1. Wing Toy Benjamin Zee, Computer hardware/software architecture, Printice- Hall of India, 1992.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, Prentice -Hall of India, 1998.

References:

1. Andrew S. Tanenbaum, Computer Networks, Printice - Hall of India, 1996.

BCEE15 / BCE 013 ENVIRONMENTAL IMPACT ASSESSMENT 3 0 0 3

1. INTRODUCTION **9**

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.

2. METHODOLOGIES **9**

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

3. PREDICTION AND ASSESSMENT **9**

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 EIA.

4. MATHEMATICAL MODELS FOR ASSESSMENT **9**

Use the mathematical models in EIA – Water quality, air quality and noise; assumptions and limitations.

5. ENVIRONMENTAL MANAGEMENT PLAN **9**

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.

Total No of Periods : 45

Text Books:

1. Canter, R.L.Environmental Impact Assessment, McGraw Hill Inc., New Delhi, 1996.
2. S.K.Shukla and P.R.Srivastava, Concepts in Environmental Impact Analysis, Common Wealth Publishers, New Delhi, 1992.

References:

1. John G.Rau and David C Hooten (Ed)., Environmental Impact Analysis Handbook, McGraw Hill Book Company, 1990.
2. Environmental Assessment Source book, vol.I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, Hand book of Environmental Impact Assessment Vol.I & II, Blackwell Science, 1999.

BCEE17 / BCE 014 INDUSTRIAL WASTE MANAGEMENT 3 0 0 3

1. INTRODUCTION **9**

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Hazardous Wastes – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes – Pollution Control Boards.

2. CLEANER PRODUCTION **9**

Waste management Approach – Waste Audit – Volume and strength reduction – material and process modifications – Recycle, reuse and byproduct recovery – Applications.

3. TREATMENT OF INDUSTRIAL WASTEWATER **9**

Equalisation – Neutralisation – removal of suspended and dissolved organic solids - Chemical oxidation – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management.

4. TREATMENT AND DISPOSAL OF HAZARDOUS WASTES **9**

Physico chemical treatment – solidification – incineration – Secured land fills – Legal Provisions.

5. CASE STUDIES **9**

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants.

Total No of Periods : 45

Text Books:

1. M.N.Rao & A.K.Dutta, Wastewater Treatment, Oxford IBH Publication, 1995.
2. W .W. Eckenfelder Jr., Industrial Water Pollution Control, McGraw-Hill Book Company, New Delhi, 1994.

References:

1. T.T.Shen, Industrial Pollution Prevention, Springer, 1999.
2. R.L.Stephenson and J.B.Blackburn, Jr., Industrial Wastewater Systems Hand book, Lewis Publisher, New Yark, 1998
3. H.M.Freeman, Industrial Pollution Prevention Hand Book, McGraw Hill Inc., New Delhi, 1995.

BCEE19 / BCE 015 AIR POLLUTION MANAGEMENT 3 0 0 3

1. SOURCES AND EFFECTS **9**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

2. DISPERSION OF POLLUTANTS **9**

Elements of atmosphere and dispersion of pollutants – Meterological factors – Wind roses – Lapse rate - Atmospheric stability and turbulance – Plume rise – Dispersion of pollutions – Gaussian dispersion models – Applications.

3. AIR POLLUTION CONTROL **9**

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic prescipitation – Selection criteria for equipment, gaseous pollutant control by adsorption absorption, condensation, combustion – Pollution control for specific major industries.

4. AIR QUALITY MANAGEMENT **9**

Air quality standards – Air quality monitoring – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment – Methods.

Total No of Periods : 45

Text Books:

1. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
2. Rao M.N., and Rao H V N., Air Pollution Control, Tata-McGraw Hill, New Delhi, 1996

References:

1. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw Hill, New Yark, 1997
2. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw Hill Publishing Company, New Delhi, 1991.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.

BCEE21 / BCE 016 MUNICIPAL SOLID WASTE MANAGEMENT 3 0 0 3

1. SOURCES AND TYPES **9**

Sources and types of solid wastes in a Municipality; Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

2. ON-SITE STORAGE & PROCESSING **9**

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

3. COLLECTION AND TRANSFER **9**

Methods of Collection – types of vehicles – Manpower – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

4. OFF-SITE PROCESSING **9**

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, options under Indian conditions.

5. DISPOSAL

Dumping of solid waste; sanitary land fills – site selection, design and operation of sanitary landfills.

Total No of Periods : 45

Text Books:

1. George Tchobanoglous et.al., Integrated Solid Waste Management, McGraw Hill Publishers, 1993.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, Waste Management, Springer, 1994.

References:

1. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 200
2. R.E.Landreth and P.A.Rebers, Municipal Solid Wastes – problems and Solutions, Lewis Publishers, 1997
3. Bhide A.D. and Sundaresan, B.B., Solid Waste Management in Developing Countries; INSDOC, 1993.

BCEE23 / BCE 017 ECOLOGICAL ENGINEERING 3 0 0 3

1. PRINCIPLES AND CONCEPTS **12**

Scope and applications of Ecological Engineering – Development and evolution of ecosystems – principles and concepts pertaining to species, populations and community – Eco Successions.

2. ECOSYSTEM FUNCTIONS **10**

Energy flow and nutrient cycling – Food chain and food webs – biological magnification, diversity and stability, immature and mature systems. Primary productivity – Biochemical cycling of nitrogen, phosphorous, sulfur and carbon dioxide; Habitat ecology Terrestial, fresh water, estuarine and marine habitats.

3. METHODS IN ECOLOGICAL ENGINEERING **15**

Biomonitoring and its role in evaluation of aquatic ecosystem; Rehabilitation of ecosystems through ecological principles – range rehabilitation; step cropping, bio-wind screens, Wetlands, Root Zone Treatment for wastewater, Reuse of treated wastewater through ecological systems.

4. ECOLOGICAL EFFECTS **8**

Ecological effects of exploration, production, extraction, processing, manufacture & transport.

Total No of Periods : 45

Text Book

1. Odum, E.P., "Fundamental of Ecology", W.B.Sauders, 1990.

References

1. Mitch, J.W. and Jorgensen, S.E., Ecological Engineering – An Introduction to Ecotechnology, John Wiley and Sons, 1996.
2. Colinvaux, P., Ecology, John Wiley and Sons, 1996.

BCEE25 / BCE 018 BRIDGE STRUCTURES 3 0 0 3

1. INTRODUCTION **9**

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders.

2. STEEL BRIDGES **9**

Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.

3. REINFORCED CONCRETE SLAB BRIDGES **9**

Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading.

4. REINFORCED CONCRETE GIRDER BRIDGES **9**

Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

5. PRESTRESSED CONCRETE BRIDGES **9**

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters -Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder –Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections.

Total No of Periods : 45

Text Books:

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
2. Ponnuswamy S., " Bridge Engineering ", Tata McGraw Hill, New Delhi, 1996.

References:

1. Phatak D.R., " Bridge Engineering ", Satya Prakashan, New Delhi, 1990.

BCEE27 / BCE 019 STORAGE STRUCTURES 3 0 0 3

1. STEEL WATER TANKS **15**

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays – Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

2. CONCRETE WATER TANKS **15**

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

3. STEEL BUNKERS AND SILOS **5**

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

4. CONCRETE BUNKERS AND SILOS **5**

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction.

5. PRESTRESSED CONCRETE WATER TANKS **5**

Principles of circular prestressing – Design of prestressed concrete circular water tanks.

Total No of Periods : 45

Text Books

1. Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998.
2. Krishna Raju N., Advanced Reinforced Concrete Design, CBS Publishers and Distributors, New Delhi, 1998.

BCEE29 / BCE 020 DESIGN OF PLATE AND SHELL STRUCTURES 3 0 0 3

1. THIN PLATES WITH SMALL DEFLECTION **9**

Laterally loaded thin plates – governing differential equations – Simply supported and fixed boundary conditions

2. RECTANGULAR PLATES **9**

Simply supported rectangular plates – Navier's solution and Levy's method

3. THIN SHELLS **9**

Classification of shells-structural actions – membrane theory

4. ANALYSIS OF SHELLS **9**

Analysis of spherical dome – cylindrical shells – folded plates

5. DESIGN OF SHELLS **9**

Design of spherical dome – cylindrical shells – folded plates

Total No of Periods : 45

Text Books

1. Bairagi N K, A text book of Plate Analysis, Khanna Publishers, New Delhi,, 1996
2. G. S. Ramaswamy, Design and Construction of Shell Structures, CBS Plublishers, New Delhi, 1996

References:

1. Szilard R, Theory and analysis of plates, Prentice Hall Inc, 1995
2. Chatterjee B. K., Theory and Design of Concrete Shells, Oxford & IBH, New Delhi, 1998
3. Billington D. P., Thin Shell Concrete Structures, McGraw Hill, 1995

BCEE31 / BCE 021 TALL BUILDINGS 3 0 0 3

1. INTRODUCTION **9**

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading –Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads -Combination of Loads.

2. THE VERTICAL STRUCTURE PLANE **9**

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel – Frame Systems - Multistory Box Systems.

3. COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD **9**

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems- Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

4. APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDING **9**

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading – Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

5. OTHER HIGH-RISE BUILDING STRUCTURE **9**

Deep - Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High - Rise Buildings - Capsule Architecture.

Total No of Periods : 45

Text Books:

1. WOLFGANG SCHUELLER " High-rise Building Structures", John Wiley&Sons.
2. Bryan Stafford Smith and Alex Coull, " Tall Building Structures ", Analysis and Design, John Wiley and Sons, Inc., 1991.

References:

1. COULL, A. and SMITH, STAFFORD, B. " Tall Buildings ", Pergamon Press, London, 1997.
2. LinT.Y. and Burry D.Stotes, " Structural Concepts and Systems for Architects and Engineers ", John Wiley, 1994.
3. Lynn S.Beedle, Advances in Tall Buildings, CBS Publishers and Distributors, Delhi, 1996.

BCEE33 / BCE 022 STRUCTURAL DYNAMICS 3 0 0 3

1. Difference between static loading and dynamic loading – Nature of dynamic loads – Wind, Earthquake and Impact Loads – Damping – Viscous and structural damping – single degree of freedom (SDOF) Systems – Formulation of equation of motion – Newton's Law and D'Alembert's principles – Examples of SDOF modeling.

2. Free vibration response of SDOF system – Response of undamped and damped SDOF system to harmonic excitation – characteristic of resonance – Response to impulse and an arbitrary forcing function – Duhamel Integral formulation.

3. MDOF systems – examples – Lumped parameter model – Formulation of equation of motion – Free vibration of MDOF systems as Eigen value problem – concept of mode shapes and natural frequencies – 2 DOF example – orthogonal properties of normal modes.

4. Harmonic excitation of 2 DOF system – Principle of mode superposition (principle only) for dynamic analysis – vibration isolation – vibration measuring instruments.

5. Effect of wind and earthquake on structures – Principles of aseismic design – Methods of vibration control – codal provisions for design for wind and earthquake (explanation of provisions only – no design)

Total No of Periods : 45

Text Books:

1. Mario Paz, Structural Dynamics Theory and Computation, Van Nostrand Reinhold, 1992
2. Anil K.Chopra, "Dynamics of Structures Theory and Applications to Earthquake Engineering" Prentice Hall of India (P) Ltd., New Delhi 1996.

References:

1. Thomson W.T., Theory of Vibration and Applications, Prentice Hall of India, 1992
2. Clough R.W. and Penzien, J., Dynamics of Structures, McGraw-Hill, 1990
3. Craig R.R. Jr., Structural Dynamics – An Introduction to Computer Methods, John Wiley and Sons, 1981

BCEE35 / BCE 023 PRE FABRICATED STRUCTURES 3 0 0 3

1. INTRODUCTION **9**

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

2. PREFABRICATED COMPONENTS **9**

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls.

3. DESIGN PRINCIPLES **9**

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

4. JOINT IN STRUCTURAL MEMBERS **9**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints.

5. DESIGN FOR ABNORMAL LOADS **9**

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

Total = 45

Text Books:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

References:

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

BCEE37 / BCE 024 WIND ENGINEERING 3 0 0 3

1. INTRODUCTION **9**

Terminology – Wind Data – Gust factor and its determination - Wind speed variation with height – Shape factor – Aspect ratio – Drag and lift.

2. EFFECT OF WIND ON STRUCTURES **9**

Static effect – Dynamic effect – Interference effects (concept only) – Rigid structure – Aeroelastic structure (concept only).

3. EFFECT ON TYPICAL STRUCTURES **9**

Tail buildings – Low rise buildings – Roof and cladding – Chimneys, towers and bridges.

4. APPLICATION TO DESIGN **9**

Design forces on multistory building, towers and roof trusses.

5. INTRODUCTION TO WIND TUNNEL **9**

Types of models (Principles only) – Basic considerations – Examples of tests and their use.

Total No of Periods : 45

Text Books

1. Peter Sachs, "Wind Forces in Engineering, Pergamon Press, New York, 1992.
2. Lawson T.V., Wind Effects on Buildings, Vols. I and II, Applied Science and Publishers, London, 1993.

References

1. Devenport A.G., "Wind Loads on Structures", Division of Building Research, Ottowa, 1990.
2. Wind Force on Structures – Course Notes, Building Technology Centre, Anna University, 1995.

BCEE39 / BCE 025 INDUSTRIAL STRUCTURES 3 0 0 3

1. PLANNING **9**

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

2. FUNCTIONAL REQUIREMENTS **9**

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

3. DESIGN OF STEEL STRUCTURES **9**

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

4. DESIGN OF R.C. STRUCTURES **9**

Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

5. PREFABRICATION **9**

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

Total No of Periods : 45

Text Books:

1. Reinforced Concrete Structural elements – P. Purushothaman
2. Pasala Dayaratnam – Design of Steel Structure - 1990

References:

1. Henn W. Buildings for Industry, vols.I and II, London Hill Books, 1995
2. Handbook on Functional Requirements of Industrial buildings, SP32 – 1986, Bureau of Indian Standards, New Delhi 1990
3. Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982

BCEE41 / BCE 026 SMART STRUCTURES AND SMART MATERIALS 3 0 0 3

1. INTRODUCTION **9**

Introduction to Smart Materials and Structures – Instrumented structures functions and response – Sensing systems – Self diagnosis – Signal processing consideration – Actuation systems and effectors.

2. MEASURING TECHNIQUES **9**

Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells – Temperature Compensation – Strain Rosettes.

3. SENSORS **9**

Sensing Technology – Types of Sensors – Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers – The LVOT – Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment – Absorptive chemical sensors – Spectroscopes – Fibre Optic Chemical Sensing Systems and Distributed measurement.

4. ACTUATORS **9**

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic actuation – Role of actuators and Actuator Materials.

5. SIGNAL PROCESSING AND CONTROL SYSTEMS **9**

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non-Linear.

Total No of Periods : 45

Text Books:

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996.

References:

1. L. S. Srinath – Experimental Stress Analysis – Tata McGraw Hill, 1998.
2. J. W. Dally & W. F. Riley – Experimental Stress Analysis – Tata McGraw Hill, 1998.

BCEE43 / BCE 027 FINITE ELEMENT ANALYSIS 3 0 0 3

1. INTRODUCTION – VARIATIONAL FORMULATION **8**

General filed problems in Engineering – Modelling – Discrete and Continuous models – Characteristics – Difficulties involved in solution – The relevance and place of the finite element method – Historical comments – Basic concept of FEM, Boundary and initial value problems – Gradient and divergence theorems – Functionals – Variational calculus – Variational formulation of VBPS. The method of weighted residuals – The Ritz method.

2. FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS **8**

One dimensional second order equations – discretisation of domain into elements – Generalised coordinates approach – derivation of elements equations – assembly of elements equations – imposition of boundary conditions – solution of equations – Cholesky method – Post processing – Extension of the method to fourth order equations and their solutions – time dependant problems and their solutions – example from heat transfer, fluid flow and solid mechanics.

3. FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS **9**

Second order equation involving a scalar-valued function – model equation – Variational formulation – Finite element formulation through generalised coordinates approach – Triangular elements and quadrilateral elements – convergence criteria for chosen models – Interpolation functions – Elements matrices and vectors – Assembly of element matrices – boundary conditions – solution techniques.

4. ISOPARAMETRIC ELEMENTS AND FORMULATION **10**

Natural coordinates inn 1, 2 and 3 dimensions – use of area coordinates for triangular elements in - 2 dimensional problems – Isoparametric elements in 1,2 and 3 dimensional – Largrangean and serendipity elements – Formulations of elements equations in one and two dimensions - Numerical integration.

5. APPLICATIONS TO FILED PROBLEMS IN TWO DIMENSIONALS **10**

Equations of elasticity – plane elasticity problems – axisymmetric problems in elasticity Bending of elastic plates – Time dependent problems in elasticity – Heat – transfer in two dimensions – incompressible fluid flow.

Total No of Periods : 45

Text Book

1. J.N.Reddy, "An Introduction to Finite Element Method", McGraw-Hill Book Co.,,Intl.Student Edition, 1985.

References:

1. Rienkiewics, "The finite element method, Basic formulation and linear problems", Vol.1, 4/e, McGraw-Hill, Book Co.
2. S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 1989.
3. C.S.Desai and J.F.Abel, "Introduction to the Finite Element Method", Affiliated East West Press, 1972.

BCEE45 / BCE 028 OFFSHORE STRUCTURES 3 0 0 3

1. WAVE THEORIES **8**

Wave generation process, small and finite amplitude wave theories.

2. FORCES OF OFFSHORE STRUCTURES **8**

Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.

3. OFFSHORE SOIL AND STRUCTURE MODELING **9**

Different types of offshore structures, foundation modeling, structural modeling.

4. ANALYSIS OF OFFSHORE STRUCTURES **10**

Static method of analysis, foundation analysis and dynamics of offshore structures.

5. DESIGN OF OFFSHORE STRUCTURES **10**

Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

Total No of periods: 45

References:

1. Chakrabarti, S.K. Hydrodynamics of Offshore Structures, Computational Mechanics Publications, 1987.
2. Thomas H. Dawson, Offshore Structural Engineering, Prentice Hall Inc Englewood Cliffs, N.J. 1983
3. API, Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms, American Petroleum Institute Publication, RP2A, Dalls, Tex.
4. Wiegel, R.L., Oceanographical Engineering, Prentice Hall Inc, Englewood Cliffs, N.J. 1964.
5. Brebia, C.A.Walker, S., Dynamic Analysis of Offshore Structures, New-nes Butterworths, U.K. 1979.
6. Reddy, D.V. and Arockiasamy, M., Offshore Structures, Vol.1, Krieger Publishing Company, Malabar, Florida, 1991.

BCEE47 / BCE 029 EARTH QUAKE RESISTANT STRUCTURES 3 0 0 3

1. **ELEMENTS OF ENGINEERING SEISMOLOGY** **9**

Definitions of magnitude, intensity, epicenter, forces – general features of tectonics of seismic regions in India – seismographs – nature of dynamic loading resulting from Earthquakes.

2. SEISMIC DESIGN CONCEPTS **9**

Review of Theory of structural vibrations induced under base excitation – single degree & multiple degree idealistaions – Response spectrum approach – Time History Analysis – Building systems with frames, with and without shear walls.

3. PERFORMANCE OF STRUCTURES **9**

Response of structural elements to the dynamic loads. Ductility and energy absorption – Regular and Irregular building types.

4. INDIAN STANDARD CODES OF PRACTICE **9**

Provisions of Indian standard code IS 1893. Approach of Ascismic analysis of miscellaneous structures such as retaining walls, water tanks, and dams. Importance of detailing. IS4326

5. MODERN CONCEPTS **9**

Base Isolation techniques – Active & Passive control – Case Studies.

Total No of Periods : 45

Reference:

1. Jaikrishna & Chandra Sekharan: " Elements of Earthquake Engineering"
2. Chopra:, A.K "Structural Dynamics & Earthquake Engineering " Prentice Hall, N.J., 1995.
3. Downrick, D.J: "Earth Resistant Design" John Wiley & Sons, London.
4. Arnold C & Reithman, R "Building configuration & seismic design"
5. Wiegel, R.I. (Ed): "Earthquake Engineering" Prentice Hall, N.J., 197.

BCEE49 / BCE 030 PAVEMENT ENGINEERING 3 0 0 3

1. TYPE OF PAVEMENT AND STRESS DISTRIBUTION **9**

Introduction - Pavement as layered structure Pavement types - rigid and flexible -Stress and deflections in pavements under repeated loading.

2. DESIGN OF FLEXIBLE PAVEMENTS **9**

Flexible pavement design - Empirical - Semi empirical and theoretical Methods - Design procedure as per lates IRC guidelines.

3. DESIGN OF RIGID PAVEMENTS **9**

Cement concrete pavements - Modified Westerguard approach - Design procedure as per latest IRC guidelines - Concrete ways and their scope in India.

4. PERFORMANCE EVALUATION AND MAINTENANCE **9**

Pavement Evaluation [Condition and evaluation surveys (Surface Appearance, Cracks, Patches And Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index]
Pavement maintenance. [IRC Recommendations Only]

5. STABILISATION **8**

Stabilisation with special reference to highway pavements - Choice of stabilisers -Testing and field control –Stabilisation for rural roads in India - use of Geo-fabric in roads.

Total No of Periods : 45

Text Book :

1. Kadiyali, L.R., Principles and Practice of Highway Engineering, Khanna tech. Publications, New Delhi, 1989.
2. Croney, D., Design and Performance of Road Pavements, HMO Stationary Office, 1979.

References :

1. Yoder R.J and Witczak M.W., Principles of Pavement Design, John Wiley, 1975.
2. Guidelines for the Design of Flexible Pavements, IRC:37 - 200, The Indian roads Congress, New Delhi.
3. Guideline for the Design of Rigid Pavements for Highways, IRC:58-1998, The Indian Roads Congress, New Delhi.

BCEE51 / BCE 031 GROUND IMPROVEMENT TECHNIQUES 3 0 0 3

1. INTRODUCTION **9**

Role of ground improvement in foundation engineering - methods of ground improvement – Geotechnical problems in alluvial, lateric and black cotton soils -Selection of suitable ground improvement techniques based on soil condition.

2. DRAINAGE AND DEWATERING **9**

Drainage techniques - Well points - Vaccum and electroosmotic methods - Seepage analysis for two dimensional flow fully and partially penetrating slots in homogenous deposits(Simple cases only).

3. INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS **9**

Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.

4. EARTH REINFORCEMENT **9**

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth - Geotextiles in filtration drainage - Separation and road works.

5. GROUND TECHNIQUES **9**

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemical - Stabilisation expansive soils.

Total No of Periods : 45

Text Books :

1. Koerner R.M., Construction and Geotechical Methods in Foundation Engineering, McGraw Hill, 1994.
2. Purushothama Raj, P.Ground Improvement Techniques, Laxmi Publications (p) Ltd., New Delhi.

References :

1. Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.
2. Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.
3. Craig, R.F., Soil Mechanics, Van Nostrant Reinhold Co.,New York, 1993.

BCEE53 / BCE 032 ROCK ENGINEERING 3 0 0 3

1. CLASSIFICATION AND INDEX PROPERTIES OF ROCKS **6**

Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose.

2. ROCK STRENGTH AND FAILURE CRITERIA **12**

Modes of rock failure – Strength of rock – Laboratory and field measurement of shear, tensile and compressive strength – Stress strain behaviour in compression – Mohr-coulomb failure criteria and empirical criteria for failure – Deformability of rock.

3. INITIAL STRESSES AND THEIR MEASUREMENTS **10**

Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – technique for measurements of insitu stresses.

4. APPLICATION OF ROCK MECHANICS IN ENGINEERING **10**

Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

5. ROCK BOLTING **7**

Introduction – Rock bolt systems – rock bolt installation technique – Testing of rock bolts – Choice of rock bolt based on rock mass condition.

Total No of Periods : 45

Text Books

1. Goodman P.E., “Introduction to Rock Mechanics, John Wiley and Sons, 1999.
2. Stillborg B., “Professional User Handbook for rock Bolting Tran Tech Publications, 1996.

References

1. Brow E.T., “Rock Characterisation Testing and Monitoring”, Pergaman Press, 1991.
2. Arogyaswamy R.N.P., “Geotechnical Application in Civil Engineering”, Oxford and IBH, 1991.
3. Hock E. and Bray J., “Rock Slope Engineering, Institute of Mining and Metallurgy”, 1991.