



Dr.M.G.R
Educational and Research Institute
Univeristy
 (Decl. U/S 3 of UGC Act 1956)
DEPARTMENT OF CIVIL ENGINEERING
B.Tech. Civil Engineering (Part Time)
Curriculum & Syllabus
2013 Regulation

I SEMESTER						
S.No	Sub. Code	Subject Name	L	T	P	C
1.	BMA13022	Mathematics - I for Civil Engineers	3	1	0	4
2.	BCE 13001	Applied Mechanics	3	1	0	4
3.	BCS13003	Computer Programming Languages	3	0	0	3
4.	BCE 13002	Engineering Earth Science	3	0	0	3
5.	BCE 13L01	Computer Aided Building Drawing	0	0	2	1
TOTAL			12	2	2	15

II SEMESTER						
S.No	Sub. Code	Subject Name	L	T	P	C
1.	BMA13025	Mathematics – II for Civil & Chemical Engineers	3	1	0	4
2.	BCE 13003	Surveying I	3	0	0	3
3.	BCE 13004	Fluid Mechanics	3	1	0	4
4.	BCE 13005	Strength of Materials	3	1	0	4
5.	BCE 13L02	Strength of Materials and Concrete Lab	0	0	2	1
TOTAL			12	3	2	16

III SEMESTER						
S.No	Sub. Code	Subject Name	L	T	P	C
1.	BMA13009	Numerical Methods for Mechanical & Civil Engineers	3	1	0	4
2.	BCE 13010	Surveying II	3	0	0	3
3.	BCE 13007	Applied Hydraulics Engineering	3	1	0	4
4.	BCE 13014	Environmental Engineering I	3	0	0	3
5.	BCE 13L04	Fluid Mechanics & Hydraulic Machinery Lab	0	0	2	1
TOTAL			12	2	2	15



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IV SEMESTER						
S.No.	Sub. Code	Subject Name	L	T	P	C
1.	BCE 13011	Structural Analysis I	3	1	0	4
2.	BCE 13012	Design of Concrete Structures I	3	1	0	4
3.	BCE 13021	Environmental Engineering II	3	0	0	3
4.	BCE 13015	Soil Mechanics	3	1	0	4
5.	BCE 13L06	Soil Mechanics Lab	0	0	2	1
TOTAL			12	3	2	16

V SEMESTER						
S.No.	Sub. Code	Subject Name	L	T	P	C
1.	BCE 13017	Structural Analysis II	3	1	0	4
2.	BCE 13018	Design of Concrete Structures II	3	1	0	4
3.	BCE 13008	Concrete and Construction Technology	3	0	0	3
4.	BCE 13013	Transportation Engineering I	3	0	0	3
5.	BCE 13022	Foundation Engineering	3	0	0	3
TOTAL			15	2	0	17

VI SEMESTER						
S.No.	Sub. Code	Subject Name	L	T	P	C
1.	BCE 13024	Design of Steel Structures	3	1	0	4
2.	BCE 13019	Transporting Engineering II	3	0	0	3
3.	BCE 13023	Estimation and Quantity Surveying	3	0	0	3
4.	BCE 13025	Prestressed Concrete Structures	3	0	0	3
TOTAL			12	1	0	13



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VII SEMESTER						
S.No.	Sub. Code	Subject Name	L	T	P	C
1	BCE 13026	Construction Management	3	0	0	3
2	BCEEXX	Elective I	3	0	0	3
3	BCE 13L16	Project work	0	0	14	7
		TOTAL	6	0	14	13

Total Credits: 15+16+15+16+17+13+13 = 105



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LIST OF ELECTIVE SUBJECTS

S.No.	Sub.Code	Subject Name	L	T	P	C
1.	BCE13E01	Transportation Planning and Systems	3	0	0	3
2.	BCE13E02	Ground Water Engineering	3	0	0	3
3.	BCE13E03	Traffic Engineering and Management	3	0	0	3
4.	BCE13E04	Housing Planning and Design	3	0	0	3
5.	BCE13E05	Hydrology	3	0	0	3
6.	BCE13E06	Environmental Impact Assessment	3	0	0	3
7.	BCE13E07	Industrial Waste Management	3	0	0	3
8.	BCE13E08	Municipal Solid Waste Management	3	0	0	3
9.	BCE13E09	Bridge Structures	3	0	0	3
10.	BCE13E10	Storage Structures	3	0	0	3
11.	BCE13E11	Tall Buildings	3	0	0	3
12.	BCE13E12	Prefabricated Structures	3	0	0	3
13.	BCE13E13	Industrial Structures	3	0	0	3
14.	BCE13E14	Smart Structures and Smart Materials	3	0	0	3
15.	BCE13E15	Finite Element Analysis	3	0	0	3
16.	BCE13E16	Earthquake Resistant Structures	3	0	0	3
17.	BCE13E17	Ground Improvement Techniques	3	0	0	3
18.	BCE13E18	Environmental Science and Engineering	3	0	0	3
19.	BCE13E19	Concrete Technology	3	0	0	3
20.	BCE13E20	Modern Methods in Surveying	3	0	0	3
21.	BCE13E21	Disaster Management	3	0	0	3



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BMA 13022 MATHEMATICS – I FOR CIVIL ENGINEERS

3 1 0 4

UNIT I ALGEBRA

12 Hrs

Binomial, Exponential, Logarithmic Series (without proof of theorems) – Problems on Summation, Approximation and Coefficients.

UNIT II MATRICES

12 Hrs

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley - Hamilton theorem (without proof) – Orthogonal reduction of a symmetric matrix to Diagonal form.

UNIT III TRIGONOMETRY

12 Hrs

Expansions of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$ and $\cos\theta$ – Expansion of $\tan n\theta$ – Expansions of $\sin n\theta$ and $\cos n\theta$ in terms of Sines and Cosines of multiples of θ – Hyperbolic functions – Separation into real and imaginary parts.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

12 Hrs

Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima by Lagrange's Method of undetermined multipliers – Jacobians.

UNIT V FOURIER SERIES

12 Hrs

Dirichlet's conditions – General Fourier series – Half range Sine & Cosine series – Parseval's identity – Harmonic Analysis.

Total no. of hrs: 60

TEXT BOOKS

1. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw Hill Publishing Co., (2005).
2. Singaravelu, Transforms and Partial Differential Equations, Meenakshi Agency, (2009). (P) Ltd.,

REFERENCE BOOKS:

1. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2007).
2. Kreyszig E., Advanced Engineering Mathematics (9 th ed.), John Wiley & Sons, (2011).
3. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).



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BCE13001

APPLIED MECHANICS

3 1 0 4

OBJECTIVES:

- To make the student aware of the various types of Stress, Strain and their relationships.
- The student will have knowledge about behavior of members subjected to various types of forces.
- The end of the course the student should know the shear force and bending moment of various types of beams under different loading condition.

UNIT I : INTRODUCTION TO FORCE CONCEPT

12 Hrs

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 forces & Varignon's theorem. Tension, Compression and Shear stress – Lateral Strain- Poisson's Ratio- Volumetric Strain – Deformation of Simple and Compound Bars - Elastic constants – Composite Sections - Thermal stresses –Thin cylinders and Spherical shells – Stresses at a point in thin Shells.

UNIT II : CENTRE OF GRAVITY AND MOMENT OF INERTIA

12 Hrs

Areas and volumes - Centroid of simple areas and volumes by integration - Centroid of composite areas - Second moment of areas - Radius of Gyration - Parallel axis and Perpendicular axis theorems - Moment of Inertia of simple areas by Integration -Moment of Inertia of Composite Areas - Mass Moment of Inertia of thin plates and simple solids.

UNIT III: BENDING MOMENT & SHEAR FORCE

12 Hrs

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.

UNIT IV: ANALYSIS OF STATICALLY DETERMINATE PLANE TRUSSES

12 Hrs

Stability and equilibrium of plane frames – Perfect frames - Types of Trusses – Analysis of forces in trusses member – Method of joints – Method of Sections – Tension co-efficient method – Graphical method

UNIT V : PRINCIPAL STRESSES & TORSION OF SHAFTS

12 Hrs

Two Dimensional – Stresses on inclined planes – Combined stresses – Principal stresses and Principal planes – Graphical treatment – Mohr's circle of stress –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 No of Hours: 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. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, Mechanics of Materials, Laxmi Publications (P) Ltd., 2003

REFERENCES

1. Kazimi S.M.A. " Solid Mechanics ", Tata McGraw Hill Publishing Company, New Delhi, 1991.
2. Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ",McGraw Hill International Editions
3. William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions 1994



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BCS13003

COMPUTER PROGRAMMING LANGUAGES

3 0 0 3

UNIT I : INTRODUCTION

Programming and compilers, 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.

9 Hrs

UNIT II: C LANGUAGE

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

9 Hrs

UNIT III: ADVANCED C PROGRAMMING

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.

9 Hrs

UNIT IV: C++

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.

9 Hrs

UNIT V: C++

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.

9 Hrs

Total No of Hours: 45

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.



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BCE 13002

ENGINEERING EARTH SCIENCE

3 0 0 3

OBJECTIVES:

- To graduate students capable to carryout fieldworks in the engineering geology and/or in Environmental geology and geological hazards specializations.
- The student shall also be able to appreciate the importance of geological formation incusing earthquake sand landslides.

UNIT I : GENERAL GEOLOGY

9 Hrs

Geology in civil engineering - branches of geology - earth structure and composition - elementary knowledge on continental drift and plate tectonics. Seismo tectonics of the Indian plate, seismic zones of India, Weathering - work of rivers, wind, glaciers.

UNIT II : MINERALOGY

9 Hrs

Physical properties of minerals - study of rock forming minerals - quartz family. Feldspar family, augite, hornblende, biotite, muscovite, calcite, garnet - properties, behavior and engineering significance of clay minerals –fundamentals of process of formation of ore minerals - coal and petroleum - their origin and occurrence in India.

UNIT III: PETROLOGY

9Hrs

Classification of Soil and Rock, Types of rock and origin: Igneous (extrusive and intrusive), sedimentary and metamorphic rocks, description occurrence, engineering properties of following rocks. Igneous rocks - granite, diorite, gabbro, pegmatite, dolerite and basalt sedimentary rocks sandstone, limestone, shale, conglomerate and breccia. Metamorphic rocks, quartzite, marble, slate, phyllite, gneiss and schist.

UNIT IV: STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD

9 Hrs

Strength Behavior of Soil and Rock , Stress and strain in rock, failure and shear failure of soil and rock, folds, faults and joints in rock, consequences of failure (earthquakes), Bearing on engineering construction. Seismic and electrical methods for civil engineering investigations.

UNIT V: GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING

9 Hrs

Geologic Mapping and Remote Sensing, Topographic maps, geologic maps, aerial photographs, LIDAR, SAR, interpretation for civil engineering projects - geological conditions necessary for construction of dams, tunnels, buildings, road cuttings, landslides - causes and preventions. Sea erosion and coastal protection.

Total No of Hrs = 45

TEXT BOOKS

1. Parbin singh, "Engineering and General geology ", S. K. Kataria & Sons, 2009
2. D. Venkat Reddy "Engineering Geology", Vikas publishing House New Delhi, 2010
3. 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
2. Blyth, "Geology for Engineers ", elbs, Pune 1995



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DEPARTMENT OF CIVIL ENGINEERING
COMPUTER AIDED BUILDING DRAWING

BCE 13L01

0 0 2 1

OBJECTIVES:

- To provide the student with an appreciation of the capabilities and limitations of the AutoCAD program.
- Course topics include basic AutoCAD

LEVEL AND SOME COMMANDS AND FUNCTIONS AS WELL AS PRACTICAL APPLICATIONS

1. Learn and use basic AutoCAD commands - manage drawing using layers, colour and line types - complete basic cad drawings, with borders, text and dimensions - use and edit text and text styles – Method of scales in various drawing - understand and the use of blocks.
2. Development of line plan for residential building. (Two assignments – one for single storied building and another for two storied building.)
3. Submission drawing for residential building including its planning and with area and parking statements and all other details as per the norms and local bye-laws. (Two assignments)
4. Industrial buildings with roof truss.
5. To draw the 3D view of residential building.

Total No of Hrs = 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.



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BMA 13025 MATHEMATICS – II FOR CIVIL & CHEMICAL ENGINEERS 3 1 0 4

UNIT I PARTIAL DIFFERENTIAL EQUATIONS

12 Hrs

Formation of PDE by eliminating arbitrary constants and eliminating arbitrary functions – Solutions of standard types of first order equations – Lagrange’s equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

12 Hrs

Classification of second order linear partial differential equations – Solutions of one dimensional wave equation, one-dimensional heat equation – Steady state solution of two dimensional heat equation (Cartesian coordinates only) – Fourier series solutions.

UNIT III LAPLACE TRANSFORMS I

12 Hrs

Transforms of simple functions – Properties of Transforms – Inverse Transforms – Transforms of Derivatives and Integrals.

UNIT IV LAPLACE TRANSFORMS II

12 Hrs

Periodic functions – Initial and final value theorems – Convolution theorem – Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficients.

UNIT V FOURIER TRANSFORM

12 Hrs

Statement of Fourier integral theorem – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval’s theorem.

Total no. of hrs: 60

TEXT BOOKS

1. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2007).
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw Hill Publishing Co., (2005).
3. Singaravelu, Transforms and Partial Differential Equations, Meenakshi Agency, (2009).

REFERENCE BOOKS

1. Kreyszig E., Advanced Engineering Mathematics (9 th ed.), John Wiley & Sons, (2011).
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BCE13003

SURVEYING I

3 0 0 3

OBJECTIVES:

- To measure the land area by chaining and the methods of clearing the obstacles.
- To measure the area and distance between the points by compass and plane table.
- To measure the elevation of points for the preparation of map.
- To measure the height and distance by theodolite.
- To know the setting out works for construction purposes.

UNIT I : INTRODUCTIONS AND CHAIN SURVEYING

8 Hrs

Definition - principles - classification - survey instruments - ranging and chaining - reciprocal **ranging** - setting perpendiculars –errors - traversing.

UNIT II : COMPASS SURVEYING AND PLANE TABLE SURVEYING

7 Hrs

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.

UNIT III: LEVELLING AND APPLICATIONS

12 Hrs

Level line - horizontal line - levels and staves - spirit level - bench marks - temporary and permanent adjustments - fly and check leveling - reciprocal leveling - longitudinal and cross sections.

UNIT IV: CONTOURING

8 Hrs

Contouring - methods –characteristics and uses of contours - plotting - calculation of areas and volumes- earth work volume.

UNIT V : THEODOLITE SURVEYING

10 Hrs

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 No. of Hours: 45

TEXT BOOKS

1. Kanetkar T.P., “Surveying and Levelling ”, vols. I and II, United Book Corporation, Pune, 1994.
2. Punmia B.C., “Surveying ”, Vols. I and II, Laxmi Publications, Mumbai, 1999.
3. N.N basak., “ Surveying and Levelling ”, Tata McGraw Hill, New Delhi, 2004.

REFERENCES

1. Clark D., Plane and Geodetic Surveying ", vols. I and II and C.B.S. Publishers,New Delhi, Sixth edition, 1991.
2. James M. Anderson and Edward M. Mikhail, “Introduction to Surveying ”, Tata McGraw Hill, New Delhi, 1995



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BCE13004

FLUID MECHANICS

3 1 0 4

OBJECTIVES

- To know the importance, application and inter-relationship of various properties of fluid.
- To study theories those explain the behaviour and performance of fluid when the fluid is flowing through the pipe.
- To understand the utilization of dimensional analysis as a tool in solving problems in the field of fluid mechanics.

UNIT I : DEFINITIONS AND FLUID PROPERTIES

9 Hrs

Definitions - Fluid and Fluid Mechanics - Dimensions and Units - Fluid properties –Viscosity, Compressibility, Surface tension and Capillarity, Continuum - concept of system and control volume.

UNIT II : FLUID STATISTICS

11 Hrs

Pascal's law and Hydrostatic equation - Forces on plane and Curved surfaces – buoyancy metacentric height – pressure measurement – gauges and manometers.

UNIT III: FLUID KINEMATICS

9 Hrs

Stream, streak and path lines - classification of flows - continuity equation - stream and potential functions –flow nets – velocity and acceleration measurement.

UNIT IV : FLUID DYNAMICS

12 Hrs

Euler and Bernoulli's equations - application of Bernoulli's equation - discharge measurement Hagen Poiseuille equation - turbulent flow - Darcy Weisbach formula

UNIT V : BOUNDARY LAYER, FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS **19 Hrs**

Definition of boundary layer - thickness and classification - displacement and momentum thicknesses – major and minor losses of flow in pipes – pipes in series and in parallel - pipe network. Dimensional analysis - Rayleigh's method - Buckingham π -theorem.

Total No of Hours: 60

TEXT BOOKS

1. Dr.R. K. Bansal., "Fluid Mechanics and Hydraulic Machines ", Laxmi Publications 2005.
2. Fox, Robert W. And McDonald, Alan T., "Introduction to Fluid Mechanics ", John Willey & sons

REFERENCES

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



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BCE13005

STRENGTH OF MATERIALS

3 1 0 4

OBJECTIVES

- To determine the deflections in beams by various methods which is an important criteria in design.
- To analyse the structural elements by energy concepts and find stresses and deflections.
- To examine the behaviour of columns and development of various theories in evaluating the critical loads and design of columns.

UNIT I : ENERGY PRINCIPLES

11 Hrs

Strain energy and strain energy density - Strain energy in tension, shear, flexure and torsion - Castigliano's & Engesser's energy theorems- Principle of Virtual Work- Application of energy theorems for computing deflection in Determinate structures – Maxwell's reciprocal theorem.

UNIT II: DEFLECTIONS

12 Hrs

Methods of Deflection Determination of Deflection curve – computation of slopes and deflections in Determinate Beams - Double Integration method – Macaulay's method – Area Moment method –Conjugate Beam method.

UNIT III : INDETERMINATE BEAMS

11 Hrs

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.

UNIT IV : COLUMNS

13Hrs

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.

UNIT V: ADVANCED TOPICS

13Hrs

Unsymmetrical Bending of Beams of Symmetrical and Unsymmetrical Sections – Box sections and its importance – Curved bars – Winkler Bach Formula - Shear Center Simple problems - Residual Stresses (only theory) - Stress Concentration (only theory) - Fatigue and Fracture (only theory).

Total No of Hours : 60

TEXT BOOKS

1. R.S. Khurmi, "Engineering Mechanics of Solids ", Prentice Hall of India, New Delhi, 1997.
2. S.S Ratan, "Strength of Materials ", Tata McGraw Hill Publishing Company, New Delhi, 2008

REFERENCES

1. Laudner T.J. and Archer R.R., " Mechanical of Solids in Introduction ", McGraw Hill International Editions, New Delhi, 1994..
2. William A.Nash, " Theory and Problems of Strength of Material" Schaum's outline series, Mc Graw Hill International Editions, New Delhi, 1994



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BCE 13L02

STRENGTH OF MATERIALS AND CONCRETE LAB 0021

OBJECTIVES

- Learn the properties of different materials like steel, concrete, timber, bricks and other materials.
- Study the behavior of different structural elements by conduct of different tests like tension, compression, torsion, impact, shear, bending and hardness tests and develop skill in use of measuring instruments.

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

Total No of Hours: 20

CONCRETE LAB

OBJECTIVES

- To do tests on cement as per IS codes of practice;
- To do tests on fine and coarse aggregates according to IS codes of Practice;
- To do tests on fresh and hardened concrete as pr IS codes of practice

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

Total No of Hours: 10



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BMA 13009 NUMERICAL METHODS FOR MECHANICAL AND CIVIL ENGINEERS

3 1 0 4

OBJECTIVES: The student will learn

- Methods of solution of algebraic equations
- Basic principles of numerical interpolation methods.
- Solution methods for ordinary and partial differential equations.

UNIT I: SOLUTION OF EQUATIONS

12 Hrs

Solution of Algebraic and Transcendental equations – Method of false position – Iteration method – Newton-Raphson method – Solution of Linear system of equations – Gauss Elimination method – Gauss-Jordan method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method – Matrix Inversion by Gauss-Jordan method.

UNIT II: INTERPOLATION

12 Hrs

Newton forward and backward differences – Central differences – Stirling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT III: NUMERICAL DIFFERENTIATION AND INTEGRATION

12 Hrs

Numerical Differentiation with interpolation polynomials – Numerical Integration by Trapezoidal and Simpson's (both $1/3^{\text{rd}}$ & $3/8^{\text{th}}$) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

UNIT IV: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

12 Hrs

Taylor's series – Euler's & Modified Euler's method – Runge Kutta method of fourth order for first & second order differential equations – Milne's predictor-corrector method – Adam-Bashforth's predictor-corrector method.

UNIT V: NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS

12 Hrs

Finite difference solutions for one dimensional heat equation (both implicit & explicit) – Bender-Schmidt method – Crank-Nicolson method – One dimensional wave equation – Two dimensional Laplace and Poisson equations – Liebmann's method.

Total No. of Hrs : 60

TEXT BOOK

- 1) Veerarajan T. (2005), "*Numerical Methods*", Tata McGraw Hill Publishing Co.

REFERENCES

- 1) Sastry S.S. (2003), "*Introductory Methods of Numerical Analysis*", Prentice Hall of India.
- 2) Kandasamy P., Thilagavathy, Gunavathy K. (2008), "*Numerical Methods*" (Vol.IV), S.Chand & Co.,
- 3) Grewal B.S. (2012), "*Higher Engineering Mathematics*", Khanna Publishers.



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BCE13010

SURVEYING II

3 0 0 3

OBJECTIVES

- At the end of the course the student will possess knowledge about Tachometric surveying
- Control surveying
- Survey adjustments
- Astronomical surveying and Photogrammetric.

UNIT I : ENGINEERING SURVEYS

9 Hrs

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

UNIT II: TACHEOMETRIC SURVEYING

9 Hrs

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.

UNIT III: CONTROL SURVEYING

9 Hrs

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

UNIT IV: SURVEY ADJUSTMENTS

9 Hrs

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

UNIT V: PHOTOGRAMMETRY -

9 Hrs

Photogrammetry - Introduction - Terrestrial 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 No of Hours: 45

TEXT BOOKS

1. Bannister A. and Raymond S., “Surveying”, ELBS, Pune, Sixth Edition, 1992.
2. Heribert Kahmen and Wolfgang Faig, " Surveying " , 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.



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BCE 13007

APPLIED HYDRAULICS ENGINEERING

3 1 0 4

OBJECTIVES

- To study the features and function of various devices used to measure the pressure of fluid.
- To study the features and function of various devices used to measure the velocity and discharge of fluid.
- To study theories those explain the behaviour and performance of fluid when the fluid is flowing in an open channel.

FLOW IN OPEN CHANNEL

UNIT I : INTRODUCTION

8 Hrs

Open channel flow - types and regime of flow - velocity distribution in open channel - specific energy - critical flow and its computation.

UNIT II : UNIFORM FLOW

14 Hrs

Uniform flow - velocity measurement - manning's and Chezy's formula - determination of roughness coefficients - determination of normal depth and velocity - most economical sections.

UNIT III : RAPIDLY VARIED FLOW

9 Hrs

Hydraulic jump - types - energy dissipation - surges - surge through channel transitions.

PUMPS AND TURBINES

UNIT IV: PUMPS

15 Hrs

Introduction – classification – rotodynamic pumps: centrifugal pumps – work done – losses - specific speed - minimum speed to start the pump- multistage pumps. Positive displacement pumps - reciprocating pump - slip - air vessels, indicator diagrams and its variations.

UNIT V : TURBINES

14 Hrs

Classification - radial flow turbines – Reaction turbines – Francis turbine – draft tube and cavitations

Total No of Hours: 60

TEXT BOOKS

1. Subramanian k., "Flow in open channels ", Tata McGraw Hill Publishing Company, New Delhi, 1994.
2. Dr. R.K.Bansal., "Fluid Mechanics and Hydraulic Machines ", Lakshmi Publications (p) ltd., Pune, 2005.
3. Kumar K.L., "Engineering Fluid Mechanics ", Eurasia publishing house (p) ltd. New Delhi, (7th edition), 1995.

REFERENCES

1. Ven Te Chow, "Open-channel hydraulics ", McGraw Hill Co., 1996 - , New York.
2. Ramamirtham S., "Fluid mechanics, Hydraulics and Fluid Machines ", Dhanpat Rai



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BCE13014

ENVIRONMENTAL ENGINEERING I

3 0 0 3

OBJECTIVES

- To know the basics, importance, and methods of water supply.
- To study the various sources and properties of water.
- To understand the various methods of conveyance of water.
- To know the basics of sewage, types of sewers and sewer material.
- To learn the features of various sewer appurtenances.

UNIT I : INTRODUCTION

9 Hrs

Scope of environmental engineering – role of environmental engineer – environmental impacts of development – sustainable development – environmental pollution – water, air and land.

UNIT II : PLANNING FOR WATER SUPPLY SYSTEMS

9 Hrs

Public water supply and sewerage systems – objectives – design period – population forecasting – water demand – sources of water – sources selection – water quality – characterization – sources of wastewater – estimation of storm runoff.

UNIT III : WATER TREATMENT

9 Hrs

Screening - types of screening - plain sedimentation – sedimentation with coagulation – settling & flotation - filtration - disinfection

UNIT IV : CONVEYANCE SYSTEM AND WATER DISTRIBUTION

9 Hrs

Water supply – intake structures - hydraulics of flow in pipes – laying, jointing & testing of pipes – appurtenances - requirements of water distribution – components - service reservoirs – network design – appurtenances – operation and maintenance – leak detection.

UNIT V : WATER SUPPLY AND DRAINAGE IN BUILDINGS

9 Hrs

Principles of design of water supply in buildings – house service connection – fixtures and fittings – systems of sanitary plumbing.

Total No of Hours: 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

REFERENCES

1. Manual on Water Supply And Treatment, 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.



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BCE 13L04 FLUID MECHANICS & HYDRALIC MACHINERY LAB 0 0 2 1

OBJECTIVES

- To learn the aim, working principle, components, function of hydraulic equipments.
- To get hand-on experience in the operation of hydraulic equipments.
- To study to take observations while the equipment is in operation.
- To study to do calculations and to draw characteristic curves.
- To interpret the results obtained to arrive a conclusion.

FLOW MEASUREMENT

12 Hrs

- i. Venturimeter.
- ii. Orifice meter.
- iii. Flow meter.

LOSSES IN PIPES

4 Hrs

Estimation of major energy and minor losses in pipes

PUMPS

10 Hrs

- Performance characteristics of
- i. Rated speed centrifugal pump.
 - ii. Multistage centrifugal pump.
 - iii. Gear pump.
 - iv. Reciprocating pump.

TURBINES

4 Hrs

Performance characteristics of Pelton wheel turbine and Francis turbine.

Total No of Hours: 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

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



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BCE 13011

STRUCTURAL ANALYSIS I

3 1 0 4

OBJECTIVES

- This course introduces students to the classical methods of structural analysis, i.e., methods for calculating forces and displacements in structures due to given loads and imposed deformations.
- Both determinate and indeterminate structures are covered.

UNIT I : DEFLECTION OF DETERMINATE STRUCTURES

10 Hrs

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

UNIT II : MATRIX METHOD FOR INDETERMINATE FRAMES

15 Hrs

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.

UNIT III: SLOPE DEFLECTION METHOD

15 Hrs

Analysis of continuous Beams – cantilever beams - Continuous beams and rigid frames (with and without sway) - Symmetry and Asymmetry -Portal Frames.

UNIT IV: MOMENT DISTRIBUTION METHOD

10 Hrs

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

UNIT V : MULTISTOREY FRAMES

10 Hrs

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

Total No of Hours: 60

TEXT BOOKS

1. Structural Analysis by T.S. Thandavamoorty
2. Bhavikatti S.S Structural Analysis Vol 1 and vol.2 ,Vikas Publishing House Pvt. Ltd New Delhi

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.



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BCE 13012

DESIGN OF CONCRETE STRUCTURES I

3 1 0 4

OBJECTIVES

- The purpose of this study is to impart comprehensive knowledge on the design of reinforced concrete structural elements such as beams, columns, slabs and footings.
- To bring about an understanding of the behaviour of reinforced concrete and the design philosophies

UNIT I : INTRODUCTION OF REINFORCED CONCRETE STRUCTURES

12 Hrs

Properties of different grades of concrete and steel, Permissible stresses, - advantages of limit state method over other methods - understanding the behavior of R.C.C. members. Load distribution of frame structure for beam, Slabs, Column, and footing. Introduction to IS 456-2000, SP: 16

UNIT II: LIMIT STATE DESIGN FOR BEAMS AND SLABS

12 Hrs

Characteristic values, partial safety factor, stress strain relationship - stress block parameters, failure criteria. Limit state of collapse in flexure- Basic Assumptions. Analysis and design of singly reinforced rectangular section & doubly reinforced section, under reinforced section & balanced section. Design and detailing of one-way and two-way slab panels as per IS code provisions.

UNIT III: LIMIT STATE DESIGN FOR SHEAR TORSION BOND AND ANCHARGE

12 Hrs

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

UNIT IV: LIMIT STATE DESIGN OF COLUMNS

12 Hrs

Basic assumptions - Types of columns – Slenderness limits for column- minimum eccentricity - Design and detailing of reinforced concrete short columns of rectangular and circular crosssections under axial load.- column under compression and Bi axial bending using IS 456;2000.Examples for practices

UNIT V: LIMIT STATE DESIGN OF FOOTINGS

12 Hrs

Design of isolated footing for column subjected to axial loads, Design Of Axially and Eccentrically loaded Rectangular footings-Design of Combined Rectangular footings for Two Columns . Design of raft.

Total No of Hours: 60

*** Note: (Use of approved data books permitted)**

TEXT BOOKS

1. N.Krishna Raju “Design of Reinforced Concrete Structures”, CBS publishers & Distributors.Latest Edition, IS456:200.
2. S.Ramamrudham,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.

REFERENCES

1. Ashok K. Jain Reinforced concrete- Limit state design- New chand & Bros, Roorkee 1997.
2. IS: 456- 2000 “Indian Standard for Plain and reinforced concrete – code of practice “Bureau of Indian Standard
3. A.P Arul Manikam “Structural Engineering”



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BCE 13021

ENVIRONMENTAL ENGINEERING II

3 0 0 3

OBJECTIVE

- To provide students with sufficient knowledge in fundamental theory and design of conventional wastewater treatment facilities followed by the principles used to design advanced wastewater treatments.

UNIT I : WATER TREATMENT

7 Hrs

Objectives – unit operations and processes – principles, functions and design of flash mixers, flocculants, sedimentation tanks and sand filters – disinfection – aeration – iron and manganese removal, defluoridation and demineralization – water softening.

UNIT II: SEWAGE TREATMENT – PRIMARY TREATMENT

7 Hrs

Objectives – unit operations & processes – principles, functions and design of screen, grit chambers and primary sedimentation tanks.

UNIT III: SEWAGE TREATMENT – SECONDARY TREATMENT

7 Hrs

Secondary treatment – activated sludge process and trickling filter; other treatment methods – stabilization ponds and septic tanks – advances in sewage treatment.

UNIT IV : SEWAGE DISPOSAL AND SLUDGE MANAGEMENT

15 Hrs

Methods – dilution – self purification of surface water bodies – oxygen sag curve – land disposal – sewage farming – deep well injection – soil dispersion system. Thickening – sludge digestion – biogas recovery - drying beds – conditioning and dewatering – sludge disposal.

UNIT V: ENVIRONMENTAL ENGINEERING DESIGN AND DRAWING

9 Hrs

Water treatment – typical layouts – flash mixer – clariflocculator – slow sand and rapid sand filters sewage treatment – typical layouts – screens – grit chamber – sedimentation tanks – trickling filter – activated sludge plant – septic tank – soil dispersion system – waste stabilization pond and sludge drying bed.

Total No of Hours: 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

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.



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BCE 13015

SOIL MECHANICS

3 1 0 4

OBJECTIVES

- Provide the description and classification of soil and analysis of stresses in soils under different loading conditions .
- To develop an understanding of the principles of effective stress in saturated soils, and its application to one dimensional compression and consolidation.

UNIT I : INTRODUCTION

13 Hrs

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.

UNIT II: SOILWATER AND WATER FLOW

10 Hrs

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.

UNIT III: STRESS DISTRIBUTIONS AND SETTLEMENT

14 Hrs

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 - Tergazhi's one-dimensional consolidation theory – computation of rate of settlement

UNIT IV: SHEARSTRENGTH

11 Hrs

Shear strength of cohesive and cohesion less soils - Mohr - Coulomb failure theory - saturated soil mass – measurement of shear strength, direct shear - triaxial compression, UU, CU and CD Test.

UNIT V: SLOPESTABILITY

12 Hrs

Slope failure mechanisms - types - infinite slopes - finite slopes - total stress analysis for saturated clay –method of slices - friction circle method - use of stability number .

Total No of Hours: 60

TEXT BOOKS

1. V.N.S. Moorthy, “soil mechanics and foundation engineering ”, uba 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. Suttan 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,



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BCE13L06

SOIL MECHANICS LAB

0 0 2 1

OBJECTIVES

- The first aim of this lab course is to illustrate some of the principles taught during the soil mechanics course.
- Knowledge of laboratory and index testing methods commonly used in Soil & foundation engineering .

1. Specific 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 No of Hrs = 30

TEXT BOOKS

1. “Soil Engineering Laboratory Instruction Manual ”, Published by the Engineering College Co-operative Society, Chennai, 1996.
2. “I.S.Code of Practice (2720) Relevant Parts ”, as amended from time to time..

REFERENCE

1. Lambe T.W., “Soil Testing for Engineers ”, John Wiley and Sons, New York, 1990.



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BCE13017

STRUCTURAL ANALYSIS II

3 1 0 4

OBJECTIVES

- To extend the concepts taught in Structural Analysis I (Determinate to indeterminate structures. Structures).
- Structures subject to this type of analysis include all that must withstand loads, such as buildings.

UNIT I: ARCHES

12 Hrs

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

UNIT II: SUSPENSION BRIDGES

12 Hrs

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

UNIT III: SPACE STRUCTURES

12 Hrs

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

UNIT IV: PLASTIC ANALYSIS OF STRUCTURES

12 Hrs

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.

UNIT V : MOVING LOADS AND INFLUENCE LINES (DETERMINATE)

12 Hrs

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 No of Hours: 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



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BCE13018

DESIGN OF CONCRETE STRUCTURES II

3 1 0 4

OBJECTIVE

- To bring about an exposure to advanced topics in structural design comprising of RCC structures and Understand design methods of specialized components of RCC structures

UNIT I : RETAINING WALLS

12 Hrs

Design of retaining walls – cantilever and counter fort.

UNIT II: SELECTED TOPICS

12 Hrs

Introduction to ductile detailing & provisions of IS 13920 - Design of Staircases - Design of flat slabs- Design Of Corbels –Design of Grid Floors.

UNIT III: WATER TANKS

12 Hrs

Design of circular and rectangular water tanks resting on ground.Design of staging and foundations.

UNIT IV : YIELD LINE THEORY.

12 Hrs

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

UNIT V: BRICK MASONRY

12 Hrs

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

Total No of Hours : 60

*** Note: (Use of approved data books permitted)**

TEXT BOOKS

1. Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hal of India, Private, Limited New Delhi, 1997
2. Krishna Raju N. Design of RC structures, CBS Publishers and distributors, New Delhi, 1995.
3. S.Ramamrudham,Design of Reinforced Concrete Structures, Dhanpat Rai publishing company(p) Ltd New Delhi.
4. 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.



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BCE 13008

CONCRETE AND CONSTRUCTION TECHNOLOGY

3 0 0 3

OBJECTIVES

- The specific course on "Concrete Technology" focuses more on detailed understanding of concrete making materials including supplementary cementitious materials. Concrete production process also forms a part of the discussion.
- Recent developments in concrete materials are also given adequate consideration. The courses will enable one to make appropriate decision regarding ingredient selection and use of concrete.

UNIT I : CONCRETE MAKING MATERIALS

9 Hrs

Aggregates classification – IS Specifications – Properties – Grading – Methods of combining aggregates – Specified gradings - Cement– Grade of cement - Chemical composition-Hydration of cement– Structure of hydrated cement. Testing of fresh and hardened concrete.

UNIT II : CONCRETE MIX DESIGN

9 Hrs

Principles of concrete mix design – Methods of concrete mix design. Special cements – Chemical admixtures– Mineral admixture- Chemical attack.

UNIT III: SUB STRUCTURE CONSTRUCTION

9Hrs

Techniques of Box jacking – Pipe Jacking – under water construction of diaphragm walls and basement – Tunneling techniques – Piling techniques – Driving well and caisson –Sinking cofferdam – Cable anchoring and grouting – Driving diaphragm walls – Sheet piles – Shoring for deep cutting – Large reservoir construction with membranes and Earth system – Well points – Dewatering and stand by plant equipment for underground open excavation.

UNIT IV : SUPER STRUCTURE CONSTRUCTION

9Hrs

Launching girders – Bridge decks – construction sequences in cooling towers, silos and chimneys – Prestressed construction - In-situ pre-stressing in high rise structures – Material handling – Erecting light weight components on tall structures

UNIT V: CONSTRUCTION EQUIPMENTS

9Hrs

Selection of equipment for earth work – Earth moving operations – Types of earthwork Equipment – Tractors – Motor graders – Scrapers – Earth movers –Equipment for foundation and pile driving. Equipment for compaction – Batching and mixing and concreting – Equipment for material handling and erection of structures –Equipment for Dredging, Trenching, Tunneling

Total No of Hours : 45

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., 'Construction Planning, 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



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BCE13013

TRANSPORTATION ENGINEERING I

3 0 0 3

OBJECTIVES

- Aim of this subject is to incorporate psychological perception of learning and reasoning of engineering aspects of highway field into Engineers in general.
- The subject involves the application of scientific and technological principles of planning, analysis, design and management to highway engineering.
- To know about highway planning and geometric design of roads

UNIT I: PLANNING AND ALIGNMENT OF HIGHWAY

9 Hrs

Highway development in india, Necessity of highway planning, macadam's method of road construction, jayakar committee recommendations and realizations, requirements of ideal alignment, factors controlling highway alignment engineering surveys for alignment, Transportation models and their application using GIS, Intelligent transport system, case studies – Fleet management system using GPS and GIS, Classification and cross section of urban and rural roads (irc), highway cross sectional elements –[irc standards]

UNIT II: GEOMETRIC DESIGN OF HIGHWAYS

9 Hrs

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]

UNIT III: RIGID AND FLEXIBLE PAVEMENTS DESIGN

9 Hrs

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]

UNIT IV: HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE

9 Hrs

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]

UNIT V : PAVEMENT MAINTENANCE

9 Hrs

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 No of Hrs = 45

*** Note: (Use of approved data books permitted)**

TEXT BOOKS

1. Khanna K And Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001
2. Kadiyali I r, Principles and Practice of Highway Engineering, Khanna technical Publications, Delhi, 2000
3. Dr K.P.Subramaniam, Transportation Engineering, Scitech Publishers, Chennai 2003

REFERENCES

1. IRC standards, 2002
2. Bureau of Indian Standards (bis) publications on highway materials, 1998



BCE 13022

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3 0 0 3

OBJECTIVE

- At the end of this course student acquires the capacity to investigate the soil condition and to design suitable foundation.

UNIT I : SOIL EXPLORATION

9 Hrs

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) .

UNIT II: SHALLOW FOUNDATION

9 Hrs

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 – components of settlement – determination of settlement of foundation on granular and clay deposit – total and differential settlement – allowable settlement – codal provisions .

UNIT III: FOOTINGS AND RAFTS

9 Hrs

Types of foundation – contact pressure distribution below footings, design of footings, Isolated footing, combined footings ,mat foundation - types - Applications-proportioning- floating foundation .

UNIT IV: PILE FOUNDATION

9 Hrs

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 .

UNIT V: RETAINING WALLS

9 Hrs

Plastic equilibrium in soils – active and passive states – rankine's theory – cohesionless, effect of water table 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)– stability analysis of retaining walls.

Total No of Hours : 45

*** Note: (Use of approved data books permitted)**

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 ,2002
4. Swamisanan, "Analysis And Design Of Structures – Limit State Design", Oxford Ibh Publishing Co Pvt Ltd. New delhi , 1998



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BCE 13024

DESIGN OF STEEL STRUCTURES

3 1 0 4

OBJECTIVES

- To introduce the student to material behavior and Load and Resistance Factor Design methodology.
- To design and analyze tension members.
- To design and analyze compressive members.
- To design and analyze beams.
- To design and analyze connections.

UNIT I: INTRODUCTION

12 Hrs

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.

UNIT II: CONNECTIONS

12 Hrs

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

UNIT III: TENSION AND COMPRESSION

12 Hrs

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 – all design based on limits state method.

UNIT IV: BEAMS

12 Hrs

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- all design based on limits state method

UNIT V: TIMBER

12 Hrs

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 codes.

Total No of Hours: 60

*** Note: (Use of approved data books permitted)**

TEXT BOOKS

1. Ramachandra, Design of Steel structures Vol.1 & II Standard Book House, New Delhi 1992
2. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Comprehensive Design of Steel Structures, Laxmi Publishers, New Delhi.
3. V.N Vazirani and M.M Ratwani, Design of Steel Structures, Khanna Publishers, New Delhi 1995.

REFERENCES

1. P. Dayaratnam, Design of Steel Structures, A H Wheeler & Co., New Delhi 1999
2. “Design of Steel Structures: Theory and Practice”, N. Subramaniam, Oxford University Press, USA.



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BCE 13019

TRANSPORTATION ENGINEERING II

3 0 0 3

OBJECTIVES

- To understand the aspects of design, construction and maintenance of railway tracks for the safe and efficient movement of public and goods. .
- To have an overall knowledge of the design and construction of airport, docks, harbors and ports as a whole.

UNIT I : PLANNING AND DESIGN FOR RAILWAY

9 Hrs

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)

UNIT II: CONSTRUCTION, MAINTENANCE AND OPERATION TRACKS

9 Hrs

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

UNIT III: AIRPORT PLANNING AND DESIGN

9 Hrs

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

UNIT IV: HARBOUR ENGINEERING & OTHER MODES OF TRANSPORT

9 Hrs

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

UNIT V: ECONOMIC EVALUATION OF TRANSPORT PROJECTS

9 Hrs

Evaluation of highway and railway projects- cost benefit analysis (benefit cost ratio, net present value, internal rate of returns (problems) environmental impact assessment, financial appraisal build, operate and transfer for highway and railway projects (basic concepts only)

Total No of Hours: 45

*** Note: (Use of approved data books permitted)**

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.



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BCE 13023

ESTIMATION AND QUANTITY SURVEYING

3 0 0 3

OBJECTIVES

- To study the functional planning of buildings as per standards;
- To study the estimate types and terms involved in estimation;
- To study the important specifications necessary for the works in buildings;
- To study the concepts of tenders and contracts;

UNIT I : ESTIMATION

9 Hrs

Types of estimates- units of measurements-methods of estimates – advantages- estimation of load bearing and framed structures –estimate of quantities in residential building- 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.

UNIT II: ESTIMATE OF OTHER STRUCTURES

9 Hrs

Estimating of septic tank, soak pit – Sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads.

UNIT III: SPECIFICATIONS AND TENDERS

9 Hrs

Data –schedule of rates- analysis of rates-specifications-sources-detailed and general specifications – tenders- contracts- type of contracts – arbitration

UNIT IV: VALUATION

9 Hrs

Necessity – basics of value engineering –capitalized value – depreciation and its methods – escalation _ value of building – calculation of standard rent – mortgage- lease.

UNIT V: REPORT PREPARATION AND CASH FLOW

9 Hrs

Principle of report preparation – report on estimate of residential building- culvert – roads – water supply and sanitary installations – tube wells – open wells. Introduction to cash flow–tools and techniques – cost control in construction project.

Total No of Hrs = 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.



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BCE13025

PRESTRESSED CONCRETE STRUCTURES

3 0 0 3

OBJECTIVES

- Prestressing methods, principles and concepts are essential for the basic concept of the subject Analysis of prestress and the resultant stresses using different concepts is dealt here.
- Determination of losses in concrete & Anchorage zone stresses in end block can be brought out using IS method.

UNIT I: INTRODUCTION – THEORY AND BEHAVIOUR

9 Hrs

Basic concepts – Advantages – Materials required – Systems and methods of pre -stressing – 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 pre-stress – Estimation of crack width

UNIT II: DESIGN

9 Hrs

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.

UNIT III: CIRCULAR PRESTRESSING

9 Hrs

General features & Design of prestressed concrete tanks – Prestressed concrete Poles, Shapes, Features & Design- Prestressed concrete sleepers – Development – Types- Design, Static & dynamic loads.

UNIT IV : COMPOSITE CONSTRUCTION

9 Hrs

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

UNIT V : PRE-STRESSED CONCRETE BRIDGES

9 Hrs

General aspects – pretension prestressed bridge decks – Post tensioned prestressed bridge decks – Advantages over R.C.C bridges – Design Principles of post tensioned prestressed concrete slab bridge deck, T Beam slab bridge deck & Continuous two span beam deck.

Total No of Hours: 45

*** Note: (Use of approved data books permitted)**

TEXT BOOKS

1. Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi, 2011
2. Mallic S.K. and Gupta A.P., Prestressed concrete, Oxford and IBH Publishing Co.Pvt. Ltd. 1997.
3. Rajagopalan.N, Prestressed Concrete, Alpha Science, 2002.

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.



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BCE13026

CONSTRUCTION MANAGEMENT

3 0 0 3

OBJECTIVES

- To make the students aware of the various construction techniques and practices.
- To impart knowledge about different methods of planning.
- To introduce a concepts of projects formulation.

UNIT I : CONSTRUCTION PLANNING

9 Hrs

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

UNIT II : APPLICATION OF PERT AND CPM IN CONSTRUCTION MANAGEMENT

9 Hrs

Introduction – Advantages of Network analysis – Activity and event oriented Network Calculation of Critical Path Scheduling - Comparison Between PERT And CPM –Activity Float and Schedules — Improving the Scheduling Process.

UNIT III: COST CONTROL MONITORING AND ACCOUNTING

9 Hrs

Cost Control - Project appraisal – Concept of payback Period – Financial accounting system and Cost accounts – Crashing and time Cost tradeoffs - Schedule and budget updates.

UNIT IV: QUALITY CONTROL AND SAFETY DURING CONSTRUCTION

9 Hrs

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

UNIT V: MANAGEMENT INFORMATION SYSTEM IN CONSTRUCTION INDUSTRY

9 Hrs

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 No of Hours: 45

TEXT BOOKS

1. Chitkara, K.K “Construction Project Management Planning “Scheduling And Control, Tata Mc Graw – Hill Publishing Co., Newdelhi, 1998.
2. S. Seetharaman - Construction Engineering & Management, Dhanpat Rai Publications ,Pune,1995.

REFEREFCS

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.



BCE 13L16

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PROJECT WORK

0 0 14 7

OBJECTIVES

- 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.



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BCE13E01

TRANSPORTATION PLANNING AND SYSTEMS

3 0 0 3

OBJECTIVES

- To study in details about roads, railways, airways and waterways.
- To study railway track construction and operation.
- To know about the fundamentals of airways.
- To know about the fundamentals of harbour and decks.

UNIT I: STUDY AREA AND SURVEYS

9 Hrs

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

UNIT II:. MODES

9 Hrs

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

UNIT III: PLAN PREPARATION AND EVALUTION

9 Hrs

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

UNIT IV: BUS TRANSPORTATION

9 Hrs

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

UNIT V: RAIL TRANSPROTATION

9 Hrs

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

Total No. of Hours : 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.



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BCE13E02

GROUND WATER ENGINEERING

3 0 0 3

OBJECTIVES

- To develop an awareness of problematic soils and selection of ground improvement techniques based on soil conditions.
- To understand drainage, dewatering, grouting technique and use of geosynthetics in ground improvement method.

UNIT I: FUNDAMENTALS OF GROUND WATER

9Hrs

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.

UNIT II: HYDRAULICS OF FLOW

9Hrs

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.

UNIT III: ESTIMATION OF PARAMETERS

9Hrs

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

UNIT IV: GROUND WATER DEVELOPMENT

9Hrs

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

UNIT V: WATER QUALITY

9Hrs

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

Total No. of Hours : 45

TEXT BOOKS

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

REFERENCES

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



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BCE13E03

TRAFFIC ENGINEERING AND MANAGEMENT

3 0 0 3

OBJECTIVES

- To study in details about Traffic Engineering and Management.
- To know the characteristics of traffic elements.
- To know the traffic control measures.
- To study about the driver and pedestrian behaviour.
- To study about the scope of traffic management.

UNIT I: INTRODUCTION

9Hrs

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.

UNITII: TRAFFIC SURVEYS AND ANALYSIS

9Hrs

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

UNIT III: TRAFFIC CONTROL

9Hrs

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

UNIT IV: DESIGN OF GEOMETRIC INTERSECTIONS

9Hrs

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).

UNIT V: TRAFFIC MANAGEMENT

9Hrs

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 Hours: 45

TEXT BOOKS

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2000.
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 Mgmt
2. Guidelines of Ministry of Road Transport and Highways, Government of India.
3. Subhash C.Saxena, A Course in Traffic Planning and Design, Dhanpat Rai Publications, New Delhi, 1989.



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BCE13E04

HOUSING PLANNING AND DESIGN

3 0 0 3

OBJECTIVES

- A house plan is a set of construction or working drawings that define all the construction specifications of a residential house .
- A truly successful project is one where project goals are identifies early on and where the interdependencies of all building systems are coordinated concurrently from the planning and programming phase.

UNIT I: INTRODUCTION TO HOUSING

9Hrs

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.

UNITII: HOUSING PROGRAMMES

9Hrs

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

UNIT III: PLANNING AND DESIGN OF HOUSING PROJECTS

9Hrs

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

UNIT IV: CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS

9Hrs

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

UNIT V: HOUSING FINANCE AND PROJECT APPRAISAL

9Hrs

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 Hours : 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.



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BCE13E05

HYDROLOGY

3 0 0 3

OBJECTIVES

- To get exposure in the field of hydrology; To know the basic concepts in hydrology.
- To study the features of precipitation, evaporation and infiltration.
- To learn basics, estimation, and modeling of runoff.
- To understand estimation, forecasting and control of flood.
- To familiarize computer applications in hydrology.

UNIT I: HYDROMETEOROLOGY

9Hrs

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.

UNITII: PRECIPITATION AND ABSTRACTIONS

9Hrs

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.

UNIT III: HYDROGRAPH ANALISYS

9Hrs

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

UNIT IV: GROUND WATER HYDROLOGY

9Hrs

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

UNIT V: FLOOD ANALYSIS

9Hrs

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

Total No. of Hours : 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.



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BCE13E06

ENVIRONMENTAL IMPACT ASSESSMENT

3 0 0 3

OBJECTIVES

- To know the objectives, capability, and limitations of environmental impact assessment.
- To learn methodologies and legal aspects of environmental impact assessment.
- To study socio economic impact assessment.
- To obtain knowledge in impact of air quality and noise impact.
- To familiarize with impact of energy, water quality, vegetation, and wild life.

UNIT I: INTRODUCTION

9Hrs

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.

UNIT II: METHODOLOGIES

9Hrs

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

UNIT III: PREDICTION AND ASSESSMENT

9Hrs

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.

UNIT IV: MATHEMATICAL MODELS FOR ASSESSMENT

9Hrs

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

UNIT V: ENVIRONMENTAL MANAGEMENT PLAN

9Hrs

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 Hours: 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.



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BCE13E07

INDUSTRIAL WASTE MANAGEMENT

3 0 0 3

OBJECTIVES

- This subject deals with the pollution from major industries and methods of controlling the same.
- The student is expected to know about the polluting potential of major industries in the country and the methods of controlling the same.

UNIT I: INTRODUCTION

9Hrs

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.

UNIT II: CLEANER PRODUCTION

9Hrs

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

UNIT III: TREATMENT OF INDUSTRIAL WASTEWATER

9Hrs

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

UNIT IV: 4. TREATMENT AND DISPOSAL OF HAZARDOUS WASTES

9Hrs

Physio chemical treatment – solidification – incineration – Secured landfills – Legal Provisions.

UNIT V: CASE STUDIES

9Hrs

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 Hours: 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 York,
3. H.M.Freeman, Industrial Pollution Prevention Hand Book, McGraw Hill Inc., New Delhi, 1995.



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BCE13E08

MUNICIPAL SOLID WASTE MANAGEMENT

3 0 0 3

OBJECTIVES

- This subject covers the various sources and characterization of municipal solid wastes and the on-site/off-site processing of the same and the disposal methods.
- The student is expected to know about the various effects and disposal options for the municipal solid waste.

UNIT I: SOURCES AND TYPES

9Hrs

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.

UNIT II: ON-SITE STORAGE & PROCESSING

9Hrs

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.

UNIT III: COLLECTION AND TRANSFER

9Hrs

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

UNIT IV: OFF-SITE PROCESSING

9Hrs

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

UNIT V: DISPOSAL

9Hrs

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

Total No. of Hours :

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.



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BCE13E09

BRIDGE STRUCTURES

3 0 0 3

OBJECTIVES

- Bridges are structures which carry people and vehicles across natural or man-made obstacles.
- There are many types of bridges. Based on the length of the barrier to be crossed, the amount and type of traffic as well as forces of nature (wind, tide and flood) different materials and shapes of bridges are used.

UNIT I: INTRODUCTION

9Hrs

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.

UNIT II: STEEL BRIDGES

9Hrs

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.

UNIT III: REINFORCED CONCRETE SLAB BRIDGES

9Hrs

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

UNIT IV: REINFORCED CONCRETE GIRDER BRIDGES

9Hrs

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.

UNIT V: PRESTRESSED CONCRETE BRIDGES

9Hrs

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 Hours: 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.



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BCE13E10

STORAGE STRUCTURES

3 0 0 3

OBJECTIVES

- Planning and layout play a very important role in industrial structures and they are important.
- Design of steel gable frame with knee joint, beam column, base plate and anchor bolt are dealt with here .
- Design of RC silos, bunkers, chimneys and cooling tower are dealt with here.

UNIT I: STEEL WATER TANKS

15Hrs

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.

UNITII: CONCRETE WATER TANKS

15Hrs

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.

UNIT III: STEEL BUNKERS AND SILOS

5Hrs

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.

UNIT IV: CONCRETE BUNKERS AND SILOS

5Hrs

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.

UNIT V: PRESTRESSED CONCRETE WATER TANKS

5Hrs

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

Total No. of Hours: 45

TEXT BOOK

1. Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998.

REFERENCE

1. Krishna Raju N Advanced Reinforced Concrete Design, CBS Publishers, New Delhi, 1998.



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BCE13E11

TALL BUILDINGS

3 0 0 3

OBJECTIVES

- To introduce various aspects of planning of Tall Buildings .
- To know about different types of loads .
- To introduce various structural systems for medium rise buildings with their behaviour and analysis.
- To introduce various structural systems for high rise buildings with their behaviour and analysis.
- To impart knowledge about stability analysis of various systems and to know about advanced topics.

UNIT I: INTRODUCTION

9Hrs

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.

UNIT II: THE VERTICAL STRUCTURE PLANE

9Hrs

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.

UNIT III: COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD

9Hrs

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.

UNIT IV: APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDING

9Hrs

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.

UNIT V: OTHER HIGH-RISE BUILDING STRUCTURE

9Hrs

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

Total No. of Hours :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.



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BCE13E12

PREFABRICATED STRUCTURES

3 0 0 3

OBJECTIVES

- At the end of this course the student shall be able to appreciate modular construction
- Industrialized construction and shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods using these elements.

UNIT I: INTRODUCTION

9Hrs

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

UNIT II: PREFABRICATED COMPONENTS

9Hrs

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

UNIT III: DESIGN PRINCIPLES

9Hrs

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

UNIT IV: JOINT IN STRUCTURAL MEMBERS

9Hrs

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

UNIT V: DESIGN FOR ABNORMAL LOADS

9Hrs

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

Total No. of Hours: 45

*** Note: (Use of approved data books permitted)**

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.



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BCE13E13 **INDUSTRIAL STRUCTURES** **3 0 0 3**

OBJECTIVES

- This course deals with some of the special aspects with respect to Civil Engineering structures in industries.
- At the end of this course the student shall be able to design some of the structures.

UNIT I: PLANNING

9Hrs

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

UNIT II: FUNCTIONAL REQUIREMENTS

9Hrs

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

UNIT III: DESIGN OF STEEL STRUCTURES

9Hrs

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

UNIT IV: DESIGN OF R.C. STRUCTURES

9Hrs

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

UNIT V: PREFABRICATION

9Hrs

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

Total No. of Hours: 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



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BCE13E14

SMART STRUCTURES AND SMART MATERIALS

3 0 0 3

OBJECTIVES

- This course is designed to give an insight into the latest developments regarding smart materials and their use in structures.
- Further, this also deals with structures which can self adjust their stiffness with load.

UNIT I: INTRODUCTION

9Hrs

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

UNIT II: MEASURING TECHNIQUES

9Hrs

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

UNIT III: SENSORS

9Hrs

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

UNIT IV: ACTUATORS

9Hrs

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

UNIT V: SIGNAL PROCESSING AND CONTROL SYSTEMS

9Hrs

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 Hours : 45

TEXT BOOK

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.



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BCE13E15

FINITE ELEMENT ANALYSIS

3 0 0 3

OBJECTIVE

- The objective is to equip students with fundamentals of finite element principles so as to enable them to understand the behaviour of various finite elements and to be able to select appropriate elements to solve physical and engineering problems with emphasis on structural and thermal engineering applications.

UNIT I: INTRODUCTION – VARIATIONAL FORMULATION

8Hrs

General field 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.

UNIT II: FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS

8Hrs

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.

UNIT III: FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS

9Hrs

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.

UNIT IV: ISOARAMETRIC ELEMENTS AND FORMULATION

10Hrs

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

UNIT V: APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSION

10 hrs

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

Total No. of Hours : 45

TEXT BOOK

1. J.N.Reddy, “An Introduction to Finite Element Method”, McGraw-Hill Book Co., Intl. 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



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BCE13E16

EARTHQUAKE RESISTANT STRUCTURES

3 0 0 3

OBJECTIVES

- To develop systematically from basic principles of structural dynamics the characteristic of dynamic behaviour of the structure, namely, response spectrum.
- To impart knowledge about materials and structural systems for structures subject to earthquake.
- To expose aspects of modern methods for seismic damage evaluation, control, repair and rehabilitation.

UNIT I: ELEMENTS OF ENGINEERING SEISMOLOGY

9Hrs

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

UNIT II: SEISMIC DESIGN CONCEPTS

9Hrs

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.

UNIT III: PERFORMANCE OF STRUCTURES

9Hrs

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

UNIT IV: INDIAN STANDARD CODES OF PRACTICE

9Hrs

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

UNIT V: MODERN CONCEPTS

9Hrs

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

Total No. of Hours : 45

*** Note: (Use of approved data books permitted)**

TEXT BOOKS

1. Jaikrishna & Chandra Sekharan: “ Elements of Earthquake Engineering”
2. Chopra:, A.K “Structural Dynamics & Earthquake Engineering ” Prentice Hall, N.J., 1995

REFERENCES

1. Downrick, D.J: “Earth Resistant Design” John Wiley & Sons, London.
2. Amold C & Reithman, R “Building configuration & seismic design” Wiegel, R.I. (Ed): “Earthquake Engineering” Prentice Hall, N.J., 197.



BCE13E17

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DEPARTMENT OF CIVIL ENGINEERING
GROUND IMPROVEMENT TECHNIQUES

3 0 0 3

OBJECTIVES

- To develop an awareness of problematic soils and selection of ground improvement techniques based on soil conditions.
- To understand drainage, dewatering, grouting technique and use of geosynthetics in ground improvement method.

UNIT I: INTRODUCTION

9Hrs

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.

UNIT II: DRAINAGE AND DEWATERING

9Hrs

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

UNIT III: INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS

9hrs

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.

UNIT IV: EARTH REINFORCEMENT

9Hrs

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

UNIT V: GROUND TECHNIQUES

9Hrs

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

Total No of Hours : 45

TEXT BOOKS

1. Koerner R.M., Construction and Geotechnical 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, Glasgow, 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.



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BCE13E18

ENVIRONMENTAL SCIENCE AND ENGINEERING

3 0 0 3

OBJECTIVES

- At the end of this course the student is expected to understand what constitutes the environment,
- what are precious resources in the environment,
- how to conserve these resources,
- what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

UNIT I: INTRODUCTION TO ENVIRONMENTAL STUDIES

9Hrs

Definition, Scope and importance – Need for Public awareness – Types of resources – Utilization of forest resources, water resources, Mineral resources, food resources, energy resources and land resources- Dams and their effects on forest and tribal people-conflicts over water- equitable use of resources for sustainable life styles.

UNIT II: ECOSYSTEMS AND BIODIVERSITY

9Hrs

Kinds of ecosystems- Structure and functions of an ecosystems- Energy flow within the ecosystem –Productivity- food chains and Trophic Levels- Ecological Pyramids- value of biodiversity – Biodiversity at global, National & local levels – Hot spots of Biodiversity –Threats to biodiversity – Endangered and Endemic species of India – Conservation of Biodiversity.

UNIT III: ENVIRONMENTAL POLLUTION

9Hrs

Environmental Pollution, sources, effects-control measures for air pollution, water pollution, Noise pollution, Land pollution, Marine pollution- Solid Waste Management- Disaster Management, e-waste pollution.

UNIT IV: ENVIRONMENTAL MANAGEMENT

9Hrs

Introduction - Environmental Management – climate change - population growth – Nuclear Accidents and Holocaust- Human Health and Human Rights- Environmental Ethics- Environmental Legislation- public awareness – Role of information Technology in Environmental & human health, e-waste management.

UNIT V: CASE STUDIES

9Hrs

Visit to a local area to document environmental assets (River/forest/grassland/hill/mountain)- Study of common plants, insects, birds- Study of simple ecosystems-pond, river, hill slopes – Visit to a local polluted site (Urban/Rural/ Industrial/ Agricultural), e-waste polluted places

Total No of Hours : 45

TEXT BOOKS

1. T.Meenambal, "Environmental Science and Engineering", MJP Publishers, Chennai, 2009.
2. P.Venugopal Rao, Environmental Science and Engineering, Prentice – Hall of India Private Limited, New Delhi , 2009.

REFERENCES

1. Iftikaruddin, "Principles of Environmental science and Engineering", Sooraj Publication, 2006.
2. G.Masters, "Environmental Engineering", New Centurion Book House, New Delhi, 2006.
3. Rajagopal, "Environmental Engineering", Oxford University Press, New Delhi.
4. Biny Joseph, "Environmental Engineering", Tata Mc Graw Hill, 2006.
5. Rana, " Essentials of Ecology and Environmental Science", Prentice – Hall of India Private Limited, New Delhi, 2003.



BCE13E19

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CONCRETE TECHNOLOGY

3 0 0 3

OBJECTIVE

- To study the properties of materials, tests and mix design for concrete.

UNIT I: CEMENT, AGGREGATES, CHEMICAL AND MINERAL ADMIXTURES

10 Hrs

Production, composition, and properties; cement chemistry; Types of cements; special cements, Mineralogy; properties, tests and standards. Water reducers, air entrainers, set controllers, specialty admixtures - structure properties, and effects on concrete properties. Introduction to supplementary cementing materials and pozzolans. Fly ash, blast furnace slag, silica fume, and metakaolin - their production, properties, and effects on concrete properties. Other mineral additives - reactive and inert.

UNIT II: CONCRETE MIX DESIGN

10Hrs

Methods of concrete mix design - New approaches based on rheology and particle packing.

UNIT III: CONCRETE PRODUCTION & FRESH CONCRETE:

8Hrs

Batching of ingredients; mixing, transport, and placement. Consolidation, finishing, and curing of concrete; initial and final set - significance and measurement. Workability of concrete and its measurement.

UNIT IV: ENGINEERING PROPERTIES OF CONCRETE:

10Hrs

Compressive strength and parameters affecting it. Tensile strength - direct and indirect; Modulus of elasticity and Poisson's ratio. Stress strain response of concrete. Dimensional stability and durability: Creep and relaxation - Parameters affecting; Shrinkage of concrete - types and significance. Parameters affecting shrinkage; measurement of creep and shrinkage.

UNITV: DURABILITY OF CONCRETE:

7Hrs

Introduction to durability; relation between durability and permeability. Chemical attack of concrete; corrosion of steel rebars; other durability issues. Special concretes, Properties and applications of: High strength - high performance concrete, reactive powder concrete. Lightweight, heavyweight, and mass concrete; fibre reinforced concrete; self-compacting concrete; shotcrete; other special concretes.

Total No of Hours : 45

TEXT BOOKS

1. Shetty. M.s., concrete technology, S.Chand and Co, pune,1984
2. A.R. Shantha kumar, Concrete technology ---

REFERENCES

1. Krishnasamy. K.T., concrete technology, Dhanapt rai - New Delhi – 1985
2. Neville, properties of concrete 1977.



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BCE13E20

MODERN METHODS IN SURVEYING

3 0 0 3

OBJECTIVES

- At the end of the course the student will posses knowledge about Tachometric surveying.
- Control surveying.
- Survey adjustments.
- Astronomical surveying and Photogrammetry.
- Fundamentals of remote sensing and GIS.

UNIT I: MODERN SURVEYING EQUIPMENT

7Hrs

Modern surveying electronic equipments: digital levels, digital theodolites, EDMs, Total stations; Principles, working and applications; Lasers in surveying.

UNIT II: PHOTGRAMMETRY

14Hrs

Photogrammetric terms; Applications; Type of photographs; Perspective geometry of near vertical and tilted photographs, heights and tilt distortions; Flight planning; Stereoscopy, base lining, floating marks, parallax equation and stereo measurements for height determination; Developments in photogrammetry: analogue, analytical and digital methods; photogrammetric instruments.

UNIT III: REMOTE SENSING

14Hrs

Introduction- Remote sensing system- data acquisition and processing; Applications; Multi concept in remote sensing. Physical basis of remote sensing- Electro-magnetic radiation (EMR)- nature, nomenclature and radiation laws; Interaction in atmosphere- nature, its effects in various wavelength regions, atmospheric windows; Interaction at ground surface- soils and rocks, vegetation, water, etc.; Geometric basis of interaction. Platform and sensors- Terrestrial, aerial and space platforms; Orbital characteristics of space platforms, sun- and geo-synchronous; Sensor systems- radiometers, optomechanical and push broom sensor; Resolution- spectral, spatial, radiometric and temporal; Data products from various air and spaceborne sensors- aerial photographs, LiDAR, Landsat, SPOT, IRS, ERS, IKONOS, etc. Image interpretation- Elements of interpretation; Manual and digital interpretation; Field verification.

UNIT IV: GEOGRAPHICAL INFORMATION SYSTEMS

10Hrs

Components of GIS- data acquisition, spatial and attribute data, pre-processing, storage and management; Data structures- raster and vector data; GIS analysis functions; Errors and corrections; Data presentation and generation of thematic maps; Applications.

Total No. of Hours: 45

TEXT BOOKS

1. Kanetkar T.P., "Surveying and Levelling ", Vols. I and II, United Book Corporation, Pune, 1994.
2. Wolf P.R. "Elements of Photogrammetry", McGraw Hill Book Company, New Delhi, 1988

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.



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DEPARTMENT OF CIVIL ENGINEERING

BCE13E21

DISASTER MANAGEMENT

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OBJECTIVE

- Disaster management refers to the policies, programs, administrative actions and operations undertaken to address a natural or man-made disaster through preparedness, mitigation, response and recovery.

UNIT I: INTRODUCTION TO DISASTERS:

9Hrs

Concepts, and definitions-Disaster, Hazard, Vulnerability, Resilience, Risks Disasters: Classification, Causes, Impacts -including social, economic, political, environmental, health, psychosocial, etc.)

UNIT II: RISK MANAGEMENT

9Hrs

Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach –disaster-development linkages – Principle of risk partnership.

UNIT III: RISK REDUCTION

9Hrs

Trigger mechanism – constitution of trigger mechanism - risk reduction by education -disaster information network - risk reduction by public awareness Application of various technologies: Data bases - RDBMS - Management Information systems - Decision support system and other systems - Geographic information systems Remote sensing-an insight - contribution of remote sensing and GIS - Case study.

UNIT IV: INTER-RELATIONSHIPS BETWEEN DISASTERS AND DEVELOPMENT:

9Hrs

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources financial arrangements – areas of improvement –disaster preparedness — emergency response.

UNIT V: DISASTER RISK MANAGEMENT IN INDIA

9Hrs

Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Total No. of Hours: 45

TEXT BOOKS

1. Pardeep Sahni, Madhavi Malalgoda and Ariyabandu, “Disaster risk reduction in Southasia”, PHI
2. Amita sinvhal, “Understanding earthquake disasters” TMH, 2010.

REFERENCE

1. Pardeep sahani, Alka Dhameja and Uma medury, “Disaster mitigation: Experiences and reflections”, PHI