

**DETAIL SYLLABI  
OF  
CIVIL ENGINEERING  
(THIRD SEMESTER TO EIGHTH SEMESTER)  
DEGREE (B.E.)**

**TRIPURA UNIVERSITY  
SURYAMANINAGAR**

**SYLLABI OF DEGREE IN CIVIL ENGINEERING**  
**(Third Semester to Eighth Semester)**  
**THIRD SEMESTER**

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
<b>Theory</b>							
01.	Solid Mechanics-I	BE/CE-301	4	0	0	100	4
02.	Surveying-I	BE/CE-302	4	0	0	100	4
03.	Hydraulics-I	BE/CE-303	3	1	0	100	3
04.	Numerical Analysis and Computer Programming	BE/CE-304	3	1	0	100	3
05.	Mathematics-III	BE/M-301	3	1	0	100	3
06.	Engg. Economics and Costing	BE/HU-301	3	0	0	100	3
<b>Practical / Sessional</b>							
07.	<u>Solid Mechanics Lab-I</u>	BE/CE-305	0	0	2	50	1
08.	Hydraulics Lab-I	BE/CE-306	0	0	2	50	1
09.	Computer Lab- 1	BE/CE-307	0	0	3	100	2
10.	Civil Engineering Drawing	BE/CE-308	0	0	3	100	2
11.	Surveying Practice-I	BE/CE-309	0	0	3	100	2
<b>Total</b>			36			1000	28

(N.B. “L” for “Lecture”, “T” for “Tutorial” and “P/S for “Practical / Sessional”)

**FOURTH SEMESTER**

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
<b>Theory</b>							
01.	Solid Mechanics-II	BE/CE-401	4	0	0	100	4
02.	Surveying-II	BE/CE-402	3	1	0	100	3
03.	Hydraulics-II	BE/CE-403	3	1	0	100	3
04.	Engineering Materials, Construction and Services	BE/CE-404	4	0	0	100	4
05.	Engineering Geology	BE/CE-405	3	1	0	100	3
06.	Managerial Economics and Management	BE/HU-401	3	1	0	100	3
<b>Practical / Sessional</b>							
07.	Engineering Geology lab	BE/CE-406	0	0	3	100	2
08.	Hydraulics Lab-II	BE/CE-407	0	0	3	100	2
09.	Surveying Practice-II	BE/CE-408	0	0	3	100	2
10.	Planning, Drawing & Estimation-Sessional	BE/CE-409	0	0	3	100	2
<b>Total</b>			36			1000	28

**FIFTH SEMESTER**

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
<b>Theory</b>							
01.	Structural Analysis-I	BE/CE-501	4	0	0	100	4
02.	Design of structures-I	BE/CE-502	4	0	0	100	4
03.	Concrete Technology	BE/CE-503	3	1	0	100	3
04.	Geotechnical Engineering-I	BE/CE-504	3	1	0	100	3
05.	Transportation Engineering-I	BE/CE-505	3	1	0	100	3
06.	Environmental Engg-I	BE/CE-506	3	1	0	100	3
<b>Practical / Sessional</b>							
07.	Structural Engg Lab -I	BE/CE-507	0	0	3	100	2
08.	Geotechnical Engineering Lab-I	BE/CE-508	0	0	3	100	2
09.	Transportation Engineering Lab-I	BE/CE-509	0	0	3	100	2
10.	Environmental Engineering Lab-I	BE/CE-510	0	0	3	100	2
<b>Total</b>			36			1000	28

**SIXTH SEMESTER**

Sl. No.	Name of Subjects	Code No	Periods/ Week			Full Marks	Credits
			L	T	P/S		
<b>Theory</b>							
01.	Structural Analysis-II	BE/CE-601	4	0	0	100	4
02.	Design of structures-II	BE/CE-602	4	0	0	100	4
03.	Water Resources Engineering-I	BE/CE-603	3	1	0	100	3
04.	Geotechnical Engineering-II	BE/CE-604	3	1	0	100	3
05.	Transportation Engineering-II	BE/CE-605	3	1	0	100	3
06.	Environmental Engg.-II	BE/CE-606	3	1	0	100	3
<b>Practical / Sessional</b>							
07.	Structural Engg Lab -II	BE/CE-607	0	0	3	100	2
08.	Geotechnical Engineering Lab-II	BE/CE-608	0	0	3	100	2
09.	Transportation Engineering Lab-II	BE/CE-609	0	0	3	100	2
10.	Environmental Engineering Lab-II	BE/CE-610	0	0	3	100	2
<b>Total</b>			36			1000	28

**SEVENTH SEMESTER**

Sl. No.	Name of Subjects	Code No	Periods/Week			Full Marks	Credits
			L	T	P/S		
<b>Theory</b>							
01.	Structural Analysis-III	BECE-701	3	1	0	100	3
02.	Design of Structures-III	BE/CE-702	4	0	0	100	4
03.	Water Resources Engg-II	BE/CE-703	3	1	0	100	3
04.	Transportation Engineering-III	BE/CE-704	3	1	0	100	3
05.	Elective-I	BE/CE-705	4	0	0	100	4
<b>Practical / Sessional</b>							
06.	Structural Engg Lab -III	BE/CE-706	0	0	3	100	2
07.	Water Resources Engg Lab.	BE/CE-707	0	0	3	100	2
08.	Elective-I Sessional	BE/CE- 708			3	100	2
09.	Project-I	BE/CE-709	0	0	5	100	3
10.	Viva-voce-I	BE/CE-710	0	0	0	50	1
11.	Professional Skill Development-I	BE/GP-2	0	0	2	50	1
<b>Total</b>			36			1000	28

**EIGHTH SEMESTER**

Sl. No.	Name of Subjects	Code No	Periods/Week			Full Marks	Credits
			L	T	P/S		
<b>Theory</b>							
01.	Design of Structures-IV	BE/CE-801	3	1	0	100	3
02.	Project Planning and Management.	BE/CE-802	3	1	0	100	3
03.	Design of Hydraulic Structures.	BE/CE-803	4	0	0	100	4
04.	Geotechnical Engineering-III	BE/CE-804	3	1	0	100	3
05.	Elective-II	BE/CE-805	4	0	0	100	4
<b>Practical / Sessional</b>							
06.	Structural Engg Lab-IV	BE/CE-806	0	0	3	100	2
07.	Civil Engineering Estimation & Costing	BE/CE-807	0	0	3	100	2
08.	Elective –II Sessional	BE/CE-808	0	0	3	100	2
09.	Project: II	BE/CE-809	0	0	5	100	3
10.	Viva-voce-II	BE/CE-810	0	0	0	50	1
11.	Professional Skill Development-II	BE/GP-3	0	0	2	50	1
<b>Total</b>			36			1000	28

# **SOLID MECHANICS-1(BE/CE-301)**

## **FIRST HALF**

### **I. Analysis of Stresses:**

Body Forces, Surface Forces, Internal Forces, Stress at a point, Components of stress in Rectangular coordinates, Stress tensor, Principal Stresses, Transformation Equation, Stress invariants, Plane Stress, Mohr's circle for plane stress, Octahedral stresses, Differential equations of equilibrium, Components of stresses in cylindrical polar coordinates.

### **II. Analysis of Strain:**

Deformable bodies, Concept of normal strain and shear strain, strain components at a point, Transformation Equations, Principal Strains, Mohr's Circle for strains, Compatibility conditions, Displacement equation of equilibrium, Plain strain.

### **III. Stress-Strain relations:**

Uniaxial tensile test, Elasticity, Inelasticity, Work-hardening, Anisotropy, homogeneity and continuity, Generalized Hooke's law, Lamé's constants, Modulus of rigidity, Bulk modulus, Relation between the elastic constants, Principle of super position, Uniqueness theorem, Thermal effects.

### **IV. Uniaxial Loading:**

Bars of variable cross-section, statically indeterminate problems in tension and compression, Thin cylindrical and spherical vessels.

### **V. Torsion:**

Geometry of deformation of a twisted circular shaft, stress and deformation in twisted circular solid and hollow shafts, strain energy due to torsion, power transmitted by circular shaft.

## **SECOND HALF**

### **VI. Bending of beams:**

Bending Moments and shear force diagrams, stresses due to bending, bending equation, shear stresses in symmetrical elastic beams transmitting both shear and bending moments.

### **VII. Deflections due to bending:**

The moment curvature relation, Macaulay's and moment area method, Castigliano's Theorem.

### **VIII. Combined stress:**

Beams subjected to bending and shear, shaft subjected to bending and torsion, short columns.

### **IX. Stability of Columns:**

Stable and unstable equilibriums, Euler's formula for long columns, Rankine's Formula.

**X. Springs:** Types of springs, Close coiled and open coiled springs.

## **Reference:-**

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Elements of Strength of Materials	Timosenko, S.P. and Young, D.H.	Affiliated East-West Press Pvt. Ltd
2. Strength of Materials	Srinath, L.S, Desai. P.	Tata McGraw-Hill.
3. Engineering Mechanics of Solids	Popov, E.P.	PHI
4. Solid Mechanics	Kazimi	Tata McGraw-Hill
5. Introduction to Solid Mechanics	Shames, H	PHI
6. Strength of Materials	Shaneloy, F.R	McGraw Hill
7. Strength of Materials Vol. I	Timoshenko, S	McGraw Hill
8. Strength of Materials	Belyaeb,N.M.	Moscow.
9. Advanced Mechanics Of Solids	Srinath, L.S.	Tata McGraw-Hill
10. Mechanics & Solids & Structures	Benham, P.P., & Warnock, F.V	
11. Mechanics & Solids & Structures	Benham, P.P Warnock, F.V	Pitman Publishing
12. Advanced Mechanics of Materials	Seely, F.B.& Smith, J.O	Tokyo,Toppan,
13. An introduction to the Mechanics of solids	S.H.Crandall N.C. Dahal, T.J. Lardener	McGraw Hill,

# **SURVEYING-I**

## **(BE/CE-302)**

### **FIRST HALF**

**Introduction and basic concepts:** Introduction, classification of surveying, Principles, some basic terms, Scale, Precision, Accuracy and errors.

**Linear Measurements:** Different methods, Instruments, Ranging out Survey lines, Measurements of lengths by chain, tape, Error in chaining Tape corrections.

**Chain Surveying:** Principle, Definition of various terms, Instruments, offsets, basic problem in chaining, Obstacles in chaining

**Compass Surveying:** Principle, Prismatic compass, Bearings, Magnetic declination, Local attraction, Error in compass surveying, Precautions.

### **SECOND HALF**

**Levelling:** Introduction, definition basic terms, instruments, Method of Levelling, Reciprocal Levelling.

**Plane Table Surveying:** Principle, instruments, Methods, Two and Three point problems.

**Area and Volumes:** Area from field measurements, Area from plans, Planimeter. Area of cross-section, Measurement of volumes, Mass diagram.

**Minor Surveying Instruments:** Various types of minor instruments.

### **Reference:-**

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Surveying Vol. I & II	Agor, R.	Khanna publications
2. Surveying Vol. I & II	Arora, K.R	Standard Book House
3. Solving Problems in Surveying	Bannister A. and Baker, R	Longman Scientific Technical
4. Engineering Surveying Technology	Bannister A. and Baker, R	Khanna publications Delhi,

5. Surveying  
Vol. I & II
6. Surveying I, II

Punmia, B.C

Laxmi publications  
Delhi,.

Kanetkar, T.P.

Pune Vidyarthi Griha  
Prakashan.

## **HYDRAULICS-I** **(BE/CE-303)**

**Properties of Fluid:** Surface tension, viscosity – Ideal and real fluids, Newtonian and non-Newtonian fluids, Incompressible and compressible fluids.

**Fluid pressure and Hydrostatics:** Pressure at a point, Pascal's law, Variation of pressure within a static fluid.

**Manometer and Mechanical Gauges:** Total pressure and centre of pressure on plane and curved submerged bodies.

**Application of Hydrostatics:** Sluice Gates, Lock Gates, Stability of dams.

**Buoyancy:** Centre of buoyancy, Metacentric height, Equilibrium of floating bodies.

**Hydraulic Measurements:** Water level measurement, Velocity and discharge measurements with different methods.

**Kinematics of flow:** Type of flows, Continuity equation in three dimensions, Velocity potential function and stream function, free and forced vortex.

**Dynamics of flow:** Euler's equation of motion, Bernoulli's equation and its application, venturimeter, orifice meter.

**Orifice and Mouth piece:** Hydraulic co-efficient definition and experimental determination, Time of emptying tanks through orifices, Flow through external and re-extract mouth piece.

**Notches and weirs:** Flow through different notches and weirs, Time of emptying a reservoir with rectangular and triangular notches.

### **Reference:-**

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Engineering Fluid Mechanics	Garde, R.J. and A.G. Mirajgaoker	Nem Chand & Bros Roorkee,1983.
2. Fluid Mechanics through Problems	Garde, R.J.	Wiley Eastern Limited New Delhi,1989.
3. Elementary Mechanics of Fluids	Hunter Rouse.	John Wiley & Sons,Inc.,1946
4. Mechanics of Fluids	L.H.Shames.	Mc Graw Hill, Int. Student , Education
5. Fluid Mechanics and its Applications	Vijay Gupta and S.K.Gupta	Wiley Eastern Ltd
6. Fluid Mechanics	Streeter, V.L	Mc Graw Hill, New



- |   |                              |   |
|---|------------------------------|---|
| 7. Experimental Fluid Mechanics           | and Wylie, E.B<br>Asawa, G.L | York, 8 <sup>th</sup> Ed., 1985.<br>Vol. 1, Nem Chand<br>and Bros., 1992. |
| 8. Fluid Mechanics and Hydraulic Machines | R.K.Bansal                   | Laxmi Publication<br>Pvt. Ltd., 2005                                      |

**NUMERICAL ANALYSIS AND COMPUTER PROGRAMMING  
(BE/CE-304)**

**FIRST HALF**

**Computer Programming:**

Elementary computer architecture, basic CPU structure and functioning, computer memories, internal and external devices.

Function of an operating system, common operating systems, basic use of an operating system.

Introduction to computer programming in either of FORTRAN or C or C++ languages. Constants and variables, Arithmetic expressions, Input/ Output statements, Simple programs. Flow charts. Control statements, Concepts of loops, One dimensional arrays, 2 dimensional arrays, matrix computations. Concept of Sub-programming, functions.

**SECOND HALF**

**Numerical Analysis:**

Approximations and round off errors, Truncation errors, Determination of roots of polynomials and transcendental equations by Newton-Rapson, Bisection Method, Secant method.

Matrix Inversion, Eigen value problems, Jacobi, Given's method.

Solutions of linear simultaneous linear algebraic equations by Gauss Elimination, and Gauss-Siedel iteration methods.

Curve fitting- linear and nonlinear regression analysis.

Numerical solution of ordinary differential equations by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector method.

Numerical integration: Trapezoidal and Simpson rule.

Programming for the above numerical methods using either of FORTRAN or C or C++ languages.

## **Reference:-**

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Numerical Methods	Shastri S.S	Prentice Hall Inc India.
2. Numerical Methods	Nobel Ben.	New York International Publications.
3. Numerical Methods For Engineering	Station Ralph G.	Englewood Cliffs N.J.,Prentice Hall Inc.,
4. Numerical Methods	Buckingham R.A.	Sir Isaac Pitman Sons. Ltd., London.
5. Numerical Methods	Grewal B.S	Khanna Pub. New Delhi.
6. Numerical Methods	Bakhvalov N.S	Mir. Pub Moscow.
7. The complete ANSI C	Sudhit Kaicker	BPB Publications New Delhi.
8. The C Programming Language.	B.W. Kernighan and D.M. Ritchie.	Prentice Hall of India.
9. Programming with C	Byron S. Gottfreid	Tata McGraw Hill 2 <sup>nd</sup> Edition.
10. Numerical Methods,	Balaguruswamy	Tata McGraw Hill.

## **MATHEMATICS-II1** **(BE/M-301)**

### **FIRST HALF**

Classical and Axiomatic construction of the theory of Probability, Conditional Probability and basic formulae, Random variables, Probability Mass Function Probability density function and Probability distribution function, functions of a random variable. Standard univariate discrete and continuous distributions and their properties. Mathematical expectations, moments, moment generating function. Multivariate distributions, marginal and conditional distributions, Conditional expectations.

Fourier series, Half range Series.

Series solution of ordinary differential equation of second order. Ordinary points and regular singular points.

Methods of least squares and curve fittings.

Partial derivatives, Chain Rule, Differentiation of implicit functions, Exact differentials. Tangent planes and Normal planes. Maxima, Minima and Saddle points. Simple problems in extremum of functions with constraints. Methods of Lagrange multipliers.

### **SECOND HALF**

Multiple-double and triple integrals. Jacobians and transformation of co-ordinates. Applications to areas, volumes, centre of pressure. Improper integrals. Test of convergence. Beta and Gamma functions.

Vector differentiation and Integration. Gradient, divergence and Curl-applications.

Functions of complex variable. Limits and Continuity and Differentiations. Analytic functions. Cauchy-Riemann equations, Conjugate functions, applications to two dimensional problems, Cauchy's Integral theorem, Taylor's and Laurent's expansions, Branch Points Zeros, Poles, Residues, Simple problems on Contour integration.

### **Reference:-**

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Advanced Engineering Mathematics.	1957.E.Kreyszig	5 <sup>th</sup> Ed., Willey Eastern.
2. Advanced Engineering Mathematics.	H.K. Das	S.Chand and Company.
3. Higher Engineering Mathematics.	B.S. Grewal.	Khanna Publishers.
4. Schaum's Outline Series	Spiegel, Murraray R	McGraw Hill Book Company.

## **ENGINEERING ECONOMICS AND COSTING( CODE-BE/HU-301)**

### **FIRST HALF**

**1.Introduction:** Definition of Economics, Subject matter, Scope and nature of Economics, Engineering Economics and its importance, Basic Concepts, Goods, utility, wealth, value, consumption, human wants.

**2. Demand and supply:** Concept Law and Elasticity, Determinant of elasticity, measurement of elasticity.

**3. The theory of production and cost:** Factors of production function, marginal products, Law of variable proportions, Returns to scale. Accounting cost and Economics costs.

**4 Theory of Firm and Pricing in various market structures:** Meaning of market, determination of output , revenue and profit in perfect and imperfect competitions.

**5. National Income, Money and Banking , Inflation:** Concept of measurement of National income; Function of money, central Bank, its functions, balance sheet and essential of sound Banking. Meaning of inflation and deflation, methods of control.

**6. Economic Reforms, Growth and Development;** Rationale of Economic Reforms in India, Meaning of Growth and Development, Concept of Planning, Economic systems – Capitalism , Socialism and Mixed Economy,.

## SECOND HALF

**7. Double Entry System Of Book Keeping:** Journal and ledger, Cash Book. Practical problems.

**8. Final Accounts:** Trading account, profit and loss account, balance sheet. Practical Problems.

**9. Bank Reconciliation Statement:** Practical Problems.

**10. Manufacturing Account:** Practical Problems.

**11. Elements of cost:** Direct Materials, direct labour, direct expenses, overheads- production, office and administration, selling and distribution. Practical Problems.

**12. Machine Hour Rate and Labour Hour Rate:** Practical Problems.

**13. Maintenance Of Stores:** Bin Card, store ledger, LIFO, FIFO, simple and weighted average, standard cost method. practical problems.

### **BOOKS RECOMMENDED:**

1. Cost Accountancy- by Bose and Das.
2. Cost Accountancy- by B . Banerjee.
3. Monetary and fiscal Economics – P. R Krishna Aiyer.
4. Industrial Organization and Engineering Economics- by T R Banga and S C Sharma.

**SOLID MECHANICS LAB-1**  
**(BE/CE-305)**

**List of Experiments:**

- 1) Introduction to testing equipments
- 2) Uniaxial tension test ( Mild Steel, Timber)
- 3) Uniaxial compression test ( Timber along and across, concrete, bricks etc.)
- 4) Torsion test (Mild Steel, aluminum)
- 5) Bending stress distribution in beams using demec gauges extensometer
- 6) Analysis of truss model with spring members.
- 7) Compression test on brick masonry specimen
- 8) Hardness test
- 9) Creep test
- 10) Impact test
- 11) Strength of Etched and Un-etched glasses
- 12) Spring test
- 13) To study the microstructure of various metals.

**Reference:**

I.S. 1608 – 1995, Mechanical Testing of Metal Tensile Testing, BIS.

**HYDRAULICS LAB-1**  
**(BE/CE-306)**

**List of Experiments**

1. To verify the momentum equation experimentally.
2. To verify the Bernoulli's Equation experimentally
3. To determine the co-efficient of friction in pipe
4. To determine the coefficient of discharge of venturimeter.
5. To determine the coefficient of discharge of an orifice meter.
6. To determine the coefficient of discharge of Triangular Notch.
7. To calibrate an orifice meter and study the variation of coefficient of discharge with the Reynolds number.

**References:**

1. Garde, R.J. and A.G. Mirajgoaker, "Engineering Fluid Mechanics (including Hydraulic Machines)", Second Ed., Nem Chand & Bros, Roorkee, 1983.

2. Garde, R.J. “Fluid Mechanics through Problems”, Wiley Eastern Limited, New Delhi.1989.
3. Hunter Rouse, “Elementary mechanics of Fluids”, John Wiley & Sons, Inc., 1946
4. L.H. Shames, “Mechanics of fluids”,Mc Graw Hill, Int.Student, Education.
5. Vijay Gupta and S.K.Gupta, Fluid Mechanics and its applications” Wiley eastern Ltd.

**COPMPUTER LAB-1**  
**(BE/CE-307)**

**Development of computer programme for**

- Numerical integration by Trapezoidal and Simpson’s rule
- Gauss-Siedel iteration method
- Various matrix operation and their use as sub-routines
- Uses of pointers, data structure, loops, arrays.

**CIVIL ENGINEERING DRAWING**  
**(BE/CE-308)**

**Drawings:**

Building Plan, elevation, Cross-section of walls,

Various bonds in brickworks,

Wood works,

Lay out of Building and Building by-laws, Introduction to I.S. : 4326.

Typical drawing of Plan ,elevation, Cross-section of walls for :

1. School Building.
2. Library.
3. Office Building.
4. Market.
5. Workshop.
6. Culvert.

**SURVEY PRACTICE-I**  
**(BE/CE-309)**

**Survey Field Works based on :**

1. Chain Surveying.
2. Compass Surveying.
3. Leveling.
4. Plane Table Surveying.

-----  
=====

## **FOURTH SEMESTER**

### **SOLID MECHANICS-II** **(BE/CE-401)**

#### **FIRST HALF**

Stress Analysis: (i) **Strength of Materials approach:** a) Bending of non-symmetric sections b) Beams of elastic foundation, c) Curved Beams, d) Beam columns.

(ii) **Theory of Elasticity :** a) Introduction of theory of Elasticity, b) Simple problems (semi-inverse method), c) Thick cylinders and pressure vessels, d) Torsion on non-circular sections, cellular members.

#### **SECOND HALF**

(iii) **Energy Methods:** a) Min. Potential and complementary energy, b) Betti-Maxwell Reciprocal theorem, c) Curved members, rings, closed Boxes, frame.

**Constitutive relations:** a) Anisotropy, b) Plasticity, c) Visco-elasticity(Kelvin, Voigt,3-element), d) Thermo-elasticity .

**Theories of failure :** Practical considerations of design a) Stress concentration, b) Fatigue, c) Dynamic Loading, d) Creep and relaxation . An independent term project is recommended after mid term.

**Reference:-**

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Elements of Strength of Materials	Timosenko, S.P. and Young, D.H.	Affiliated East-West Press Pvt. Ltd
2. Engineering Mechanics of Solids	Popov, E.P.	PHI
3. Solid Mechanics	Kazimi	Tata McGraw-Hill
4. Introduction to Solid Mechanics	Shames, H	PHI
5. Strength of Materials	Shaneloy, F.R	McGraw Hill
6. Strength of Materials Vol. II	Timoshenko, S	McGraw Hill
7. Strength of Materials	Feodosyev, V	Mir Publishers
8. Mechanics & Solids & Structures	Benham, P.P., & Warnock, F.V	
9. Mechanics & Solids & Structures	Benham, P.P Warnock, F.V	Pitman Publishing
10. Advanced Mechanics of Materials	Seely, F.B.& Smith, J.O	Tokyo,Toppan,1952
11. An introduction to the Mechanics of solids	S.H.Crandall N.C.Dahal, T.J.Lardener	McGraw Hill,1985
12. Advanced Mechanics Of Solids	Srinath, L.S.	Tata McGraw-Hill

**SURVEYING-II  
(BE/CE-402)**

**FIRST HALF**



**Theodolite Surveying** – Introduction, Types of Theodolite, Definitions of Terms, Temporary adjustments, Measurement of various angles, Fundamental lines and their relations, Sources of Error in theodolite work. Traversing, Balancing of traverse, Calculation of traverse area.

**Tacheometry** – Introduction, Use of tacheometry, Different types of Tacheometric measurements, Principle of stadia method, Anallatic lens, Determination of contents, Measurements of horizontal and vertical distance, Substation bar.

**Contouring** – Definition, uses, characteristics, Method of contouring, Contour Gradient, Ghat tracer.

**Trigonometrical leveling** – Introduction, Base of the object accessible, Base of the object inaccessible.

## SECOND HALF

**Hydrographic Surveying** – Introduction, Methods, Sounding, Locating the sounding, Reduction of soundings, The capacity of a reservoir or lake, Stream gauging.

**Curve**- Introduction, Classification, Elements of curves and notation, Designation of curve, Formula for various elements of curve, setting of horizontal and vertical curve, Field problem in setting out work.

Adjustment of Survey instruments.

**Project Surveys**- Introduction, Railway projects, Road projects, Project survey on flow Irrigation, Water Supply, and Sanitary scheme, Tunneling, Topographic Survey, and City Survey.

### Reference:-

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Surveying Vol. I & II	Agor,R.	Khanna publications
2. Surveying Vol. I & II	Arora,K.R	Standard Book House
3. Solving Problems in Surveying	Bannister A. and Baker,R	Longman Scientific Technical
4. Engineering Surveying Technology	Bannister A. and Baker,R	Khanna publications Delhi, 1995.
5. Surveying Vol. I & II	Punmia,B.C	Laxmi publications Delhi, 1996.
6. Surveying Vol. I	Kanetkar,T.P.	Pune Vidyarthi Griha <u>Prakashan.</u>

**HYDRAULICS-II**  
**(BE/CE-403)**

**FIRST HALF**

1. **Introduction:** Difference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation.
2. **Uniform Flow :** Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section.
3. **Energy and Momentum Principles:** Critical depth, Concepts of specific energy and specific force, application of specific energy, principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

**SECOND HALF**

4. **Non-Uniform flow in Open Channel:** Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, flow in curved channels.
5. **Hydraulic Jump, Surges, Water Waves:** Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, equation of motion for unsteady flow, open channel surge, celerity of the gravity wave, deep and shallow water waves.

**Reference:-**

<b>Name of Book</b>	<b>Author</b>	<b>Publisher</b>
1. Engineering Fluid Mechanics	Garde, R.J. and A.G. Mirajgaoker	Nem Chand & Bros Roorkee,1983.
2. Fluid Mechanics through Problems	Garde, R.J.	Wiley Eastern Limited New Delhi,1989.
3. Elementary Mechanics of Fluids	Hunter Rouse.	John Wiley & Sons,Inc.,1946
4. Mechanics of Fluids	L.H.Shames.	Mc Graw Hill, Int. Student , Education Wiley Eastern Ltd
5. Fluid Mechanics and its Applications	Vijay Gupta and S.K.Gupta	Wiley Eastern Ltd
6. Fluid Mechanics	Streeter, V.L and Wylie, E.B	Mc Graw Hill, New York, 8 <sup>th</sup> Ed., 1985.
7. Experimental Fluid Mechanics	Asawa, G.L	Vol 1, Nem Chand and Bros., 1992.
8. Fluid Mechanics and	R.K.Bansal	Laxmi Publication

**ENGINEERING MATERIALS, CONSTRUCTION AND SERVICES  
(BE/CE-404)**

**FIRST HALF**

**Building Materials:**

Bricks, Stone, Lime, Timber, Plywood, Glass, Plastics, Steel, Aluminium: Classification, Properties and selection criteria. Cement, Aggregate, Admixture: Types, Properties and selection criteria and tests.

Preparation and properties of concrete, concrete mix design.

Introduction to destructive and non-destructive tests. Mortar: Types, classification and strength, I.S. specifications.

**Building Construction:**

Building byelaws, modular co-ordination. Loads on buildings. Types of foundation and selection criteria. Brick Masonry, Stone Masonry, Bonds. Types of walls, partition and cavity walls, design criteria.

Prefabricated construction. Plastering and pointing. Damp proofing materials and techniques.

Types of floors, Construction details and selection criteria. Types of roof and roof covering, treatment for water proofing.

Doors and windows: Sizes and locations, Material.

Stair and Staircases: Types, materials, proportions.

Lifts and escalators: White Washing, Colour Washing, Painting, Distempering.

Shuttering, Scaffolding and centering. Expansion and construction joints.

Sound and fire proofing construction, I.S. specifications.

**SECOND HALF**

**Services:**

Water Supply plumbing in buildings, Water supply in high rise buildings, Hot water supply.

Drainage Plumbing- Sanitary fittings and house drainage system, Refuse disposal from individual house, high rise buildings.

Acoustics- Criteria and terminology, acoustics auditorium, class room etc.

Air-conditioning and ventilation in industrial houses and public buildings.

Fire fighting arrangements in houses and high rise buildings.

Electrical services, Electrical installation and wirings, Lighting systems for residential and public buildings.

**References:**

<b>NAME</b>	<b>AUTHOR</b>	<b>PUBLISHERS</b>
1. A text book of Building Construction.	Arora, S.P., Bindra, S.P.	Dhanpat Rai and Sons. Delhi.
2. Building Construction.	Jha, J & Sinha, S.K.	Khanna Publishers, Delhi.
3. A text Book of Engineering Materials.	Kulkarni, C.J.	Ahmedabad Book Depot, Ahmedabad.
4. A text Book of Engineering Construction.	Kulkarni, C.J.	Ahmedabad Book Depot, Ahmedabad.
5. Engineering Materials.	Kumar Sushil. Publishers.	Standard  Distributors, Delhi
6. Building Construction.	Kumar Sushil.	Standard Publishers Distributors, Delhi.
7. Building Construction.	McKay W.B.	Vol. 1 to 4, Orient Longman Ltd., Hyderabad,
8. A text book of Building	Punmia, B.C.	Laxmi Publications, Delhi, Madras.
9. Engineering Materials.	Singh Surendra.	Konark Publishers Pvt. Ltd.

**ENGINEERING GEOLOGY**  
**(BE/CE – 405)**

**FIRST HALF**

1. Introduction to Geology- Different branches of Geology, Geological time scale and time-srtatigraphic conception, relevance of Geology in Civil Engineering.

2. Origin of Earth : Summary of chronologic theories evolved- modern theory; composition and internal structure of earth, major crystal features and plate tectonics; Earthquakes and related hazards, mountain building, volcanoes, landslides, Modern method for estimating Age of earth, Landform and land forming processes.
3. Elementary concepts of mineralogy, petrology, structural geology with special emphasis on structures in igneous, metamorphic and sedimentary rocks.
4. Engineering Geological/ geotechnical problems and particular relevance of geology to civil engineering projects, Geotechnical properties of rock. Geotechnical considerations of ground water, environment, natural resources and Energy.

### **SECOND HALF**

5. Geology of Dam and reservoir sites, tunnels, hill slope
6. Weathering and erosion of rocks including rapid mass wasting movements.
7. Fundamentals of Geophysical Prospecting, Importance of Seismic method and electrical resistivity method to civil engineering projects, Brief description of Seismic and Electrical resistivity prospecting for civil engineering purposes.
8. Engineering seismology (causes of earthquakes; seismic waves; magnitude, intensity and energy release; characteristics of strong earthquake ground motions), Earthquake occurrence in the world, Plate tectonics, Faults.

### **References:**

<b>Name</b>	<b>Author</b>
1. A text book of Engg. Geology.	N. Chennakesavulu.
2. General Geology For Engineers.	A.E.Kehew.
3. Engineering Geology. An Environmental Approach.	Perry H. Rahu.
4. Engineering And General Geology.	Prabin Singh.
5. Geology and Engineering.	Leggot, R.F.
6. A Geology for Engineers	Bhyth, F.G.M.
7. Geology of India and Barma.	M.S.Krishnan.
8. Stuctural Geology.	Marland P. Billing.
9. Geology for Civil Engineers.	A.C.Mclean, C.D.Gribble.

10. A text Book of Geology. P.K.Mukherjee.  
11. Geology of India. D.N.Wadia.

## **Managerial Economics and Management(BE/HU-401)**

### **FIRST HALF**

**1.Basic concepts and functions of management:** Planning: Nature, Purpose and Objectives of planning, organizing: Nature and purpose, Authority and Responsibility, Staff Bug, Supply of Human Resources, performance Appraisal, Controlling: System and Process of controlling, control Techniques.

**2.Human Resource management & marketing management:** Nature and scope of human resource planning, Training and development, Recruitment and selection, career growth, Grievances, Motivation and its types, needs for motivation, Reward and Punishment, Models for motivation, Leaders:Kind of Leader, Leadership styles, Roles and function of leaders, Conflict management, Kinds and cause of conflict, Settlement of conflict, Group and team working, Organizational design and development.

**3.Marketing Environment:** Consumer Markets and Buyer behavior marketing Mix, Advertising and Sales promotion, Channels of Distribution

**4.Financial Management:** Need of Finance, Kind and sources of capital, Shares & debentures, Fixed and working capital, Capital structure of a firm, Operating and Financial Leverage, EBIT, EPS Analysis. Functional ratio Analysis: Uses and nature, Liquidity coverage ratios, Practical problems.

**5. Investment decisions and forecasting of working capital:**

Kinds of capital budgeting decisions, evaluation of proposal, Capital discounting and non-discounting based method, Practical problem, definition and importance of working capital. Working capital operating cycle, factors affecting working capital,Inventory management introduction to cash and receivables management. Practical problems.

### **SECOND HALF**

**6.Cost and cost control:** Elements of costs, Types of Costs-direct and indirect, Variable and fixed, labour cost, Material cost, Over head Cost. Cost control techniques, Budgets-meaning, kinds, budgetary control, break-even analysis, practical problems.

**7.Basic concepts and economic forecasting: Introduction:** Definition, meaning, subject matter and scope of business economics or managerial economics. Demand analysis and forecasting, demand estimation methods.

**8.Game theory and pricing:** Game theory and strategic behavior, Pricing: Determinants of price, pricing under different market structures, perfect competition monopoly and monopolistic competition, pricing methods in practice, peak load pricing, cost plus or mark up pricing.

**9.Risk and Capital Budgeting:** Risk and Decision making, Risk Management, Decision Tree Analysis, Capital Budgeting : meaning, process, the cost of capital, mergers and acquisitions, evaluation of investment decisions, Break Even Analysis.

**References:**

1. M. Y. Khan and P. K . Jain, “ Financial Management:, Tata Mcgraw Hill, 1997.
2. Y. K. Bhusan, “ Fundamentals Of Business Organizations and Management ”, S. Chand and Sons, 1998.
3. Philip Kotler , “ Marketing Management” , Prentice Hall Of India, 1997.
4. Chandra Prasanna, “ Fundamentals Of Financial Management:, Tata Mcgraw Hill,1994.
5. Fred Luthans, “ Human Resource and Management”, Tata Mcgraw Hill,1997.
6. Stephen P Rabbins, “ Organizational Behavior Concepts, Controversies and Applications:, Prentice Hall, Englewood Cliff, New Jersey1998.
7. Craig H Peterson,” Managerial Economics”, Pearson Education.
8. Suma Damodaran, “ Managerial Economics”, Oxford University Press.
9. D. N. Dwivedi’s “Managerial Economics”, Vikash Publishing House Pvt. Ltd.

**ENGINEERING GEOLOGY-Lab  
(BE/CE – 406)**

1. Megascopic identification of minerals and rocks.
2. Microscopic identification of some selected minerals and rocks.
3. Interpretation of Geological Maps-
  - a) Drawing the geological sections of geological maps.
  - b) Inter-relation of Geological maps and sections with respect to sub surface structure.
4. Problems of Locating Sites of projects like Dams, Tunnels, Highways.

**Hydraulic Lab-II  
(BE/CE – 407)**

**List of Experiments:**

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad –crested weir and study the pressure distribution on the upstream face of weir.
6. To study the characteristics of free hydraulic jump.
7. To study the flow over a free overfall in an open channel and to determine the end depth.

### **SURVEYING PRACTICE-II (BE/CE-408)**

1. Triangulation Survey including adjusted coordinates.
2. Trilateration Survey.
3. Plane Table Survey including Two and Three point Problems.
4. Layout of Curves.
5. Layout of Building and Culvert.
6. Topographic Mapping ( i.e. Plotting of the details of well contours area).
7. Volume Calculation.

### **PLANNING DRAWING AND ESTIMATION SESSIONAL (BE/CE-409)**

#### **Building Drawing:**

Object of plan, elevation and sectional elevations, Scale and type of Drawings. I.S. specifications.

#### **Quantity Estimation:**

Principles of estimation, methods and units. Estimation of materials in buildings: Foundation walls, floors and roofs, R.B. and R.C.C. works, plaster, white washing, Distempering and Painting, doors and windows, lump sum items. Principles of general and detailed specifications for various building works, analysis of rates and schedule of rates.

#### **Drawing Estimation:**

Survey of existing building on the campus. Preparation of a report giving its salient features including the following details on the drawing sheets: Ground floor plan, two sectional elevations, front and site elevations, plan and sectional elevations of a staircase, door, window/ventilator, floor and roof.

#### **Analysis of Rates:**

Definitions of analysis of rates, Prime cost, Work charged establishment, Resource planning through analysis of rates, P.W.D. Schedules and cost indices for building material and labour, Measurement and measurement books.

#### **Valuation:**



Purpose of valuation, Terminology, Factors affecting the value of a property, valuation and its different aspects, methods of valuation such as Rental method, Direct compensation method, Profit based method and development method, Capitalized value and depreciation.

**References:-**

<b>NAME</b>	<b>AUTHOR</b>	<b>PUBLISHERS</b>
1. Architectural Drafting	Bellis, H.F. & Schmidt, W.A.	McGraw Hill Book Co. Ltd., London.
2. Masonry and Timber Structure including Earthquake Resistant Design.	Arya, A.S.,	Nem Chand and Bros., Roorkee (U.P).
3. Estimating and Costing in Civil Engineering- Theory and Practice.	Dutta, B.N.,	UBS Publishers Distrubutors Ltd. New Delhi.
4. Estimating , Costing and Valuation in Civil Engg.	Chakraborty, M.,	-----
5. Manual of Estimating	Goyal, S.C. and Jain, O.P.,	Nem Chand and Bros., Roorkee (U.P).
6. Building Drawing.	Shah, M.G., Kale, C.M. and Patki, S.Y.,	Tata McGraw Hill Publishing Co.Ltd NewDelhi.
7. Engineering Drawing and Geometry.	Hoelscher, R.P. & Springer, C.H.,	John Wiley & Sons Inc. London.

**FIFTH SEMESTER**

**Structural Analysis-I  
BE/CE-501**

**FIRST HALF**

Classification of Structures, Stress resultants, Degrees of freedom per node, Static and Kinematic Indeterminacy.

Classification of Pin jointed Determinate Trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient

Analysis of determinate beams & plane frames, bending moment, Shear force diagrams and thrust diagrams, Elastic curves (Sketch).

Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment.

## SECOND HALF

Analysis of Arches, Linear Arch, Eddy's theorem, three hinged parabolic arch, Spandrel braced arch, moving loads & influence lines.

Strain Energy of deformable systems, Betti's & Maxwell's reciprocal theorem, Castigliano's theorem and application. Unit load & application of conjugate beam method.

Bending of Curved bars in plane of bending, stresses in bars of small and large initial curvatures.

Analysis of fixed beam, continuous beam and simple frames with and without translation of joints by Method of Consistent Deformation and Three moments Theorem.

### References:

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Basic Structural Analysis	Reddy, C. S.	Tata McGraw Hill
2. Elementary Structural Analysis	Norris and Wilbur	Tata McGraw Hill
3. Theory & Analysis of Structures Vol. I&II	Jain, O. P. and Jain B. K	Nem Chand & Bors., Roorkee, India
4. Structural Analysis	Coates, R. C., Coutie, M. G. & Kong, F.K	English Language & Book Society & Nelson
5. Structural Analysis	Ghali, A & Neville, M.	Chapman & Hall Publications
6. Advanced Structural Analysis	Jain, A.K	Nem Chand & Bors., Roorkee, India
7. Theory of Structures, Vol. II	Jain, O.P. & Arya A. S	Nem Chand & Bors., Roorkee, India
8. Indeterminate Structural Analysis	Kinney, J.S.	McGraw Hill Book Company
9. Indeterminate Structural Analysis	Wang, C. K	McGraw Hill Book Company

## Design of Structures-I (BE/CE-502)

### FIRST HALF

## **Reinforced Concrete structures:**

### **Material properties**

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

### **Design philosophies**

Working stress, ultimate strength and limit state method of design.

### **Analysis and Design of Sections in Bending**

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

### **Shear and Bond**

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

### **Serviceability Conditions**

Limit state of deflection and cracking, calculation of deflections.

## **SECOND HALF**

### **Design of Columns**

Short and Long columns, eccentrically loaded columns.

### **Slabs, Lintels & Staircases**

Design of one way and two way slabs; circular slabs, yield line theory for slabs, lintel and stair cases.

#### **Flat slabs**

Introduction to flat slabs.

#### **Torsion**

Design of beam for torsion.

**References:**

<b>Name of books</b>	<b>Author</b>	<b>Publisher</b>
1. Limit state Design of Reinforced Concrete	P.C Vargheese	P.H.I. Publisher
2. Limit State Design of R.C.C Structures	A.K. Jain	Nem chand Brothers, Roorkee
3. Design of Reinforced Concrete Structures	N.Krishnaraju	CBS Publishers
4. Reinforced Concrete Design	C.K.Wang & C.G. Salman	Harpur International Edition
5. Reinforced Concrete Design	Mallik and Gupta	Oxford and IBH Publications

**Concrete Technology  
(BE/CE-503)****FIRST HALF**

**Cement and admixtures:** Types of Portland cement-hydration-setting and hardening process-Special hydraulic cement-accelerator and retarders-air-entraining agents-plasticizers and super plasticizers.

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

**Fresh aggregates:** Rheological aspects such as workability –flow ability, compatibility and mobility of concrete-factors affecting workability-Determination segregation-bleeding &laitance.

**Strength of concrete:** Compressive strength and factors affecting it -behaviors of concrete under various stress states-testing of hardened concrete-cube and cylindrical test-platen affect-flexure test-splitting test-non-destructive test such as rebound hammer, USPV, core cutting stress strain relation and modulus of elasticity-shrinkage-creep of concrete and its effect.

## SECOND HALF

**Durability of concrete:** Corrosion of rebars-sulphate attack-frost action-deterioration by fire-concrete in sea water-acid attack-carbonation.

**Mix-Design:** basic consideration-cost-workability-strength and durability-grading –method of mix design-acceptance criteria of mix design.

**Advances in construction materials:** High strength concrete-fiber reinforced concrete-concrete containing polymers-Heavy weight and light weight concrete-mass concrete-blended concrete-Ferro cement and its application.

## References :

Name of the Books	Authors	Publishers
1.Concrete Technology	M.S.Shetty	S.Chand & Comp.Ltd
2.Propertis of concrete	A.M.Neville	Longman,UK
3.Concrete Structure,properties and materials	P.K.Mehta	Prentice Hall.Inc.USA
4.Concrete technology	M.L.Gambhir	Tata McGraw Hill,New Delhi
5 Polymers in Civil Engg.	J.H.Bungey	Surrey University Press,New York

## Geotechnical Engineering - I (BE/CE-504)

### FIRST HALF

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

**Simple Soil Properties:** Basic Definitions; Phase relations; Index properties of soil-soil grain and soil aggregate properties of coarse grained and fine grained soils.

**Soil Classification:** Indian Standard Soil Classification System

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

**Principle of Effective Stress and related Phenomena:** Principle of effective stress; Capillarity; seepage force and quick sand condition; Total pressure and elevation heads.

## SECOND HALF

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

**Seepage through Soils:** Two dimensional flow problems- steady flow, confined flow and unconfined flow; Flow nets and their characteristics; Uplift pressure; Exit gradient; Failure due to piping; Criteria for design of filters; Quick Sand; Liquefaction.

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

**Stress Due to Applied Load:** Introduction; Stress-Strain parameters; Geo-static Stresses; Vertical stress due to concentrated loads; Isobar diagram; Isobar diagram; Vertical Stress distribution on a horizontal plane; Influence Diagram; Vertical stress distribution due to line load, strip load, circular area, rectangular area; Nemark's Influence charts.

**Seismic Behavior of Soils:** Introduction, effect of soil shaking, Soil Liquefaction, Ground Improvement Techniques.

### References:

Name of the Books	Author	Publisher
1. Basic and Applied Soil Mechanics	Gopal Ranjan and Rao, A.S.R	New Age International, New Delhi
2. Soil Mechanics in Engineering Practice	Terzaghi, K, and Peck, R.B	John Wiley, New York, 1968.
3. Soil Mechanics and Foundation Engineering	Arora, K.R.,	Standard Publishers Distributors, New Delhi-110006.

## Transportation Engineering - I (BE/CE-505)

### FIRST HALF

**Role of Transportation Engineering;** Modes of transportation- Their importance and limitations; Importance of Highway Transportation;

**Highway Planning-** Principle of Highway Planning, Road development and Financing, Privatization of Highways,

**Highway Alignment**

Requirements, Engineering Surveys for Highway locations;

**Geometric Design**

Cross section elements, Width, Camber, Design Speed, Sight distances, Requirements and Design of horizontal and Vertical Alignments;

Different type of Road; Pavement construction- Types of Pavement, Earth work, Sub grade, Water bound macadam, Bituminous Macadam, Earthen Roads, Bituminous Surfacing: Rigid Pavement Joints;

**SECOND HALF**

**Highway Materials-** Material Characterization, Test of Sub grade soil, Aggregates and Bituminous Materials, Bituminous Mix design;

Pavement Design- Flexible and Rigid;

Highway Drainage- Surface Drainage and Sub-soil drainage; Maintenance and Strengthening;

**References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
1. Highway Engineering	Khanna, S.K. and Justo, CEG,	Nem Chand & Bros
2. Highway Engineering	Kadiyali, L.R	Khanna Publishers

**Environmental Engineering - I  
(BE/CE-506)**

**FIRST HALF**

**General**

Environment and its components, Role of an Environmental Engineer.

**Air Pollution:** Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

**Municipal Solid Wastes:** Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid wastes management (reuse/ recycle, energy recovery, treatment and disposal).

**Noise Pollution:** Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

## SECOND HALF

**Water Demand:** Design flows, design periods, and design population, factors affecting water consumption, water demand, and design capacities for various water supply components.

**Quality of Water:** The hydrological cycle and water quality, physical, chemical and biological water quality, water quality parameters, water quality requirements, Indian standards.

**Treatment of Water:** Historical overview of water treatment, water treatment process, water treatment process (Theory and Application): Aeration, solid separation, settling operations, coagulation, softening, filtration, disinfections, other treatment process: dissolved solid removal, treatment design, preparation of hydraulic profiles.

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

### References:

Name of the Books	Author	Publisher
1. Environmental Engineering and Tchobanoglous	Peavy, H.S., Rowe, D.R.	McGraw Hill Book Company, 1985.
2. Water and waste water Engineering	fair, G.M., Geyer, J.C and Okun, D.S	fair, G.M., Geyer, J.C and Okun, D.S
3. Water supply and Pollution Control	Viessman, Jr. and Hammer, M.J	Harper Collins College publishers, 1985.
4 Water supply, Waste Disposal and Environmental Pollution Engineering.	A.K.Chatterjee	Khanna Publishers
5. Water supply and sanitary Engineering	S.C.Rangawala, K.S.Rangawala P.S.Rangawala	Charotar publishing housing
6. Water supply and sanitory Engineering	G.S.Birdie & J.S. Birdie	Dhanpat Rai publishing Company, New Delhi.
7. Environmental Engineering	Peavy H.S.,	McGraw Hill Book



- |  |  |  |
|--|--|--|
| 8. Sewage Disposal and Air<br>Pollution Control Engineering<br>Environmental Engineering Vol.I | Row D.R. and<br>Tchobanoglous G<br>S.K.Garg, | Company, 1985<br><br>Khanna Publishers,<br>1979. |
|--|--|--|

### **Structural Engg. Lab-I (BE/CE-507)**

#### **List of Experiments:**

1. Fineness of cement by sieving
2. Water content for standard consistency of cement.
3. Initial and final setting times of cement
4. Fineness of cement by air permeability method.
5. Soundness of Cement by Le-Chatelier's Apparatus.
6. Soundness of cement by Autoclave test method.
7. Compressive strength of cement.
8. Tensile strength of cement
9. Moisture content and bulking of fine aggregate.
10. Gradation & Fineness modulus of coarse and fine aggregates.
11. Water absorption, compressive strength of Bricks.
12. Workability of cement concrete by (a) Slump test, and compaction factor test.
13. Concrete mix design for a given concrete strength and slump by I.S. Code method.
14. Flexural strength of concrete.
15. Tensile and bend test of M.S and HYSD bar.

#### **References:**

- | <b>1.</b> | <b>Name of the Books</b>                        | <b>Authors</b> | <b>Publishers</b>                |
|-----------|---|----------------|----------------------------------|
| 2.        | Concrete Technology                             | M.S.Shetty     | S.Chand & Comp.Ltd               |
| 3.        | Properties of concrete                          | A.M.Neville    | Longman,UK                       |
| 4.        | Concrete Structure, properties<br>and materials | P.K.Mehta      | Prentice Hall.Inc.USA            |
| 5.        | Concrete technology                             | M.L.Gambhir    | Tata McGraw Hill,New<br>Delhi    |
| 6.        | Polymers in Civil Engg.                         | J.H.Bungey     | Surrey University Press,New York |

### **Geotechnical Engineering lab-I (BE/CE-508)**

#### **List of Experiments:**

1. Grain Size analysis of Soil by Sieve.
2. Specific Gravity of Soil.

3. Grain size analysis of Soil by Hydrometer.
4. Field Density of Soil.(Two Methods)
5. Atterberg Limits of Soil ( Two methods)
6. Permeability test of Soil.
7. Consolidation Test of Soil.
8. Determination of moisture content by rapid moisture metre.
9. Standard Proctor test of Soil.

**References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
Soil Testing and Instrumentation. (Revised Edition),	Alam Singh,	New Age International, New Delhi, 1998.

**Transportation Engg.Lab-I  
(BE/CE-509)**

List of Experiments:

1. Determination of Water absorption of road aggregates
2. Determination of Specific gravity of aggregates
3. Determination of Impact Test of aggregates
4. Los Angel's abrasion test
5. Devel's abrasion test
6. Test for Crushing Strength of Aggregates
7. Determination of Flakiness and Elongation Indices of aggregates, Angularity number
8. Determination of Penetration of bitumen
9. Determination of Viscosity of bitumen (Saybolt)

**References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
1. Concrete Technology	M.S.Shetty	S.Chand & Comp.Ltd
2 Method of Test for aggregate IS:2386,(Part I,II,III,IV) 1963. for concrete		Bureau of Indian Standards
3. Determination of Softening point of bitumen. IS:1205-1978		Bureau of Indian Standards
4. Determination of Penetration of bitumen. IS:1203-1978		Bureau of Indian Standards
5. Determination of Viscosity of bitumen. IS:1206-1978(I)		Bureau of Indian Standards
6. Determination of Flash Point of bitumen. IS:1209-1978		Bureau of Indian Standards

**Environmental Engg.Lab-I**

**(BE/CE-510)**

List of Experiments:

1. Collection and analysis of sound samples.
2. Classification of Solid wastes.
3. Air volume sampling.
4. Determination of turbidity, colour and conductivity.
5. Determination of pH, alkalinity and acidity.
6. Determination of hardness and chlorides.
7. Determination of residual chlorine and chlorine demand.
8. Determination of Dissolved Oxygen.
9. Determination of Most Probable Number (MPN) of Coliforms.

**References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
1. Environmental Engineering	Peavy, H.S., Rowe, D.R and Tchobanoglous	McGraw Hill Book Company, 1985.
2. Water and waste water Engineering	fair, G.M., Geyer, J.C and Okun, D.S	fair, G.M., Geyer, J.C and Okun, D.S
3. Water supply and Pollution Control	Viessman, Jr. and Hammer, M.J	Harper Collins College publishers, 1985.
4 Water supply, Waste Disposal and Environmental Pollution Engineering.	A.K.Chatterjee	Khanna Publishers
5. Water supply and sanitary Engineering	S.C.Rangawala, K.S.Rangawala P.S.Rangawala	Charotar publishing housing
6. Water supply and sanitory Engineering	G.S.Birdie & J.S. Birdie	Dhanpat Rai publishing Company, New Delhi.
7. Environmental Engineering	Peavy H.S., Row D.R. and Tchobanoglous G	McGraw Hill Book Company, 1985
8. Sewage Disposal and Air Pollution Control Engineering Environmental Engineering Vol.I	S.K.Garg,	Khanna Publishers, 1979.

\*\*\*\*\*

**SIXTH SEMESTER**

**Structural Analysis-II  
BE/CE-601**

**FIRST HALF**

Analysis of fixed beams, continuous beam and simple frames with and without translation of joints by Slope –Deflection method, Moment distribution method, Energy method, Kani's Method, Column Analogy method.

Muller –Breslau's principle and its application of drawing influence lines for indeterminate beams.

Suspension Bridges, Analysis of cables with concentrated and distributed loadings. Basics of two and three hinged stiffening girders, influence line for bending moment and shear force in stiffening girders

## SECOND HALF

Analysis of two –hinged arches, influence line diagrams for maximum bending moment, shear force and thrust.

Basics of Plastic Analysis, Application of Static and Kinematic theorem for plastic analysis of beams and plane frames.

### References:

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Basic Structural Analysis	Reddy, C. S.	Tata McGraw Hill
2. Elementary Structural Analysis	Norris and Wilbur	Tata McGraw Hill
3. Theory & Analysis of Structures I&II	Jain, O. P. and Jain B. K	Nem Chand & Bros.Roorkee Vol.
4. Structural Analysis	Coates, R. C., Coutie, M. G. & Kong, F.K	English Language & Book Society & Nelson
5. Structural Analysis	Ghali, A & Neville, M.	Chapman & Hall Publications
6. Advanced Structural Analysis	Jain, A.K	Nem Chand & Bors., Roorkee, India
7. Theory of Structures, Vol. II	Jain, O.P. & Arya A. S	em Chand & Bors., Roorkee, India
8. Indeterminate Structural Analysis	Kinney, J.S.	McGraw Hill Book Company
9. Indeterminate Structural Analysis	Wang, C. K	McGraw Hill Book Company
10. Matrix Analysis of framed Structures	Weaver, W. & Gere, J. M.	CBS Publishers & Distributors, Delhi.
11. Plastic Method of Structural	Neal, B. G	Chapman and Hall

## Design of Structures-II ( BE/CE – 602 )

### FIRST HALF

Steel structures:

#### **Introduction**

Properties of structural steel, I.S. Rolled Sections, I.S. Specifications.

#### **Design Approach**

Factor of safety, permissible and working stresses, elastic method, plastic method, introduction to limit states of design.

**Connections**

Riveted, bolted and welded connections, strength & efficiency and design of joints, Introduction to high strength friction grip bolts.

**Tension Members**

Design of tension members .

**SECOND HALF****Compression members**

Strut and column, built-up column, column with lacings and batten. column splices.

**Beams**

Stability of flange and web, build-up sections, plate girders including stiffeners, connections and curtailment of flange plates. Design of web Splice.

**Beam-column connection.**

Stability considerations, Interaction formulae.

**Column bases**

Slab base, Gusseted base and Grillage footing.

**References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Design of Steel Structures I, II	Ramchandra	Standard book House Vol – Delhi
2. Design of Steel Structures	L.S.Negi	Tata Mc Graw Hill
3. Design of steel structures	A.S Arya & J.L.Azmani	Nem chand &Brothers Roorkee

**Water Resources Engineering-I**  
**(BE/CE – 603 )**

**FIRST HALF****Introduction**

Definition, functions and advantages of irrigation, Present Status of irrigation in India, Soil classification for agriculture, Soil moisture and Crop-Water relations, Irrigation- Water quality,

Duty and consumptive use of water, Principal Indian crop seasons and water requirements, Multiple cropping, Hybrid crops.

### **Canal Irrigation**

Types of canals, Parts of canal Irrigation system, Planning and alignments of irrigation canals, assessment of water requirements, Estimation of channel losses, Estimation of design discharge of a canal, Canal outlets, canal regulations, Flow measurements,

### **Design of Channel on Regime Concept**

Design of channel based on maximum permissible velocity, Kennedy's silt theory, Lacey's theory, Lacey's regime equation, design of channel on Lacey's theory, other regime equations' fitted equation.

### **Design of Stable Channels**

Rigid boundary channels carrying Clearwater and sediment laden water, Alluvial Channels carrying Clearwater and sediment laden water, Procedure for design of irrigation channels, Various components of canal structures, Sediment distribution, Silting and berming of channel,

## **SECOND HALF**

### **Hydraulics of Alluvial Rivers**

Critical tractive force, Incipient motion of sediment, Regimens of flow, Resistance of flow in alluvial channels, Transport of sediment.

### **Lining of channel**

Necessity of lining, types of lining, Types of drainage arrangement, Selection of drainage arrangement, Design aspect of lined channel, procedure of design, Use of design chart Data of lined canals.

### **Surface and Subsurface Flow considerations for design of Canal Structures**

Design for surface and subsurface flows, Bligh's, Lane's and Khosla's methods, Design of falls distributory and cross regulators, energy dissipation,

### **Water logging and Drainage Engineering**

Causes of water logging, effects of water logging, Measures for it prevention, Causes of Reclamation of salt effected Lands, Reclamation Procedure,

### **Drainage Engineering**

Importance and objective of drainage, Surface drainage systems, Open or surface drains, design aspect of open drain. Closed or Sub surface drainage system, Design of Tile drain. Steady state formulae, Kirkhams formulae, Bureau of Reclamation formula, Leaching requirements.

### **References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Irrigation and water Resources Engineering	G.L.Asawa	New age International Publishers
2. Theory and Design of Irrigation Structure	R.S.varshney	Nem Chand & Bros.Roorkee

## **Geotechnical Engineering-II**

**(BE/CE – 604 )**

### **FIRST HALF**

#### **Shear Strength Behavior**

Introduction; Stress at a point and Mohr's stress circle; Mohr-Coulomb failure criterion; Laboratory tests for shear strength determination; Effective stress and total stress shear strength parameters; UU, CU and CD tests and their relevance to field problems; Shear strength characteristics of normally consolidated and preconsolidated clays; Shear strength characteristics of sands

#### **Soil Exploration**

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

#### **Earth Pressures and Retaining Structures**

Earth pressure at rest; Active and passive earth pressure computations using Rankine's and Coulomb's earth pressure theories; Culmann's graphical construction; Additional Earth pressure due to surcharge and earthquake loading.  
Stability analysis for retaining walls; Choice of backfill material and importance of drainage.  
Bracing for open cuts- Recommended design diagrams of earth pressure for typical soils.

### **SECOND HALF**

#### **Soil Stabilisation**

Introduction; Mechanical stabilization; Cement stabilization; Lime stabilization; Bitumen stabilization; Chemical stabilization; Thermal stabilization; Electrical stabilization; Stabilisation by grouting; Stabilisation by Geotextile and fabrics; Reinforced earth.

#### **Stability of Slope**

Introduction; Basis of Analysis; Different factors of safety; Types of slope failures; Stability of an infinite slope in cohesive soils and cohesionless soil; Wedge failure; Culmann's method, Friction circle method; Swedish circle method; Stability of slope under steady seepage condition; Stability of slope during construction; Bishop's simplified method; Improving of Stability of Slope.



## **Geosynthetics**

Introduction; Various types of Geosynthetics, Major Uses of Geosynthetics; Emerging and Future Developments of Geosynthetics.

### **References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
1. Basic and Applied Soil Mechanics	Gopal Ranjan and Rao, A.S.R	New Age International New Delhi, 1998
2. Soil Mechanics in Engineering Practice	Terzaghi, K, and Peck, R.B.,	John Wiley, New York, 1998
3. Soil Mechanics and Foundation Engineering	Arora, K.R	Standard Publishers Distributors, New Delhi

## **Transportation Engineering - II** **(BE/CE - 605)**

### **FIRST HALF**

Railways: Role of Railway Transportation, Advantages and Dis-advantages of Railway Transportation,

Elements of permanent track way: Rails, Rail Gauges, Sleepers, Ballast, Rail Joints, Fittings,

Principal of Traction: Tractive Effort, Train resistances,

Elements of Geometric Design: Gradients and Grade compensation on Curves, Cant, Transition Curve, Vertical curve,

Sub grade and Embankments: Cutting, Level, Function, Formation of sub grade, Materials used, Slope and Stability of Embankment,

Points and Crossings: Turnouts, Diamond crossings, Crossovers,

Stations and Yards,

### **SECOND HALF**

Signals: Signaling and interlocking, Necessity, Mechanical Devices, Detectors, Stretcher bar, Point lock, Slotting of signals, Connecting Devices, Temperature compensation,

Track Drainage,

Safety in Railways,

Modernization of Track for High Speeds, Modern Methods for Track Maintenance,

Railway Expenses, Rates and Fares.

### **Reference:**

<i>Name of the Book</i>	<i>Author</i>	<i>Publisher</i>
1. Railway Track Engineering	Mundry	Tata McGraw Hill,
2. Railway Track Engineering	Agarwal M.M	Prabha&Co.

## **Environmental engineering -II** **(BE/CE - 606)**

### **FIRST HALF**

#### **General**

**Terms:** sewerage, domestic Sewage, Sewage treatment, Disposal, Scope, role of an Environmental Engineer. Historical overview

#### **Sewage Characteristics**

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

#### **Collection of Sewage**

**System of sewerage:** Separate, combined and partially separate, components of sewerage systems, systems of layout, Quantity of sanitary sewage and variations, quantity of storm water, rational method, shapes of sewer, circular and egg shaped, Hydraulic design of sewers: diameter, self cleansing velocity and slopes, Construction and testing of sewer lines, Sewer materials, joints and appurtenances, sewage pumping and pumping stations, Maintenance of Sewerage system.

### **SECOND HALF**

#### **Sewage Treatment**

**Various units:** Their purposes sequence and efficiencies, Preliminary treatment: Screening and grit removal units oil and grease removal, Primary treatment, Secondary Treatment: activated sludge process, trickling filter, Sludge digestion and drying beds. Stabilization pond, Septic tank, soakage systems, Imhoff tank, Recent trends in sewage treatment, advanced wastewater treatment: nutrient removal, solids removal.

#### **Wastewater Disposal and Reuse**

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

#### **Plumbing for Drainage of Buildings**

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

#### **References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
1. Environmental Engineering	Peavy, H.S.,Rowe,D.R and Tchobanoglous	McGraw Hill Book Company,1985.
2. Water and waste water Engineering	fair,G.M.,Geyer,J.C and Okun,D.S	fair,G.M.,Geyer,J.C and Okun,D.S
3. Water supply and Pollution Control	Viessman,Jr.and Hammer,M.J	Harper Collins College publishers,1985.
4 Water supply, Waste Disposal and Environmental Pollution Engineering.	A.K.Chatterjee	Khanna Publishers
5.Water supply and sanitary Engineering	S.C.Rangawala,  K.S.Rangawala P.S.Rangawala	Charotar publishing housing
6. Water supply and sanitary Engineering	G.S.Birdie & J.S. Birdie	Dhanpat Rai publishing Company, New Delhi.
7. Environmental Engineering	Peavy H.S., Row D.R. and Tchobanoglous G	McGraw Hill Book Company, 1985
8. Sewage Disposal and Air Pollution Control Engineering Environmental Engineering Vol.I	S.K.Garg,	Khanna Publishers, 1979.
9.Water supply and sanitary Engg.	S.C.Rangawala K.S.Rangawala P.S.Rangawala	Charotar publishing House

## **Structural Engg Lab –II**

**(BE/CE-607)**

### **List of Experiments:**

1. Clark Maxwell's Reciprocal theorem using a beam
2. analysis of redundant joint
3. a) Deflections of a truss  
b) Maxwell's Reciprocal theorem.
4. Elastic displacements of curved members
5. Elastic properties of beams
6. Three hinged arch
7. Two hinged arch
8. Behavior of struts and columns.

9. Experimental and Analytical study of 3 bar pin jointed truss.
10. Experimental and Analytical study of deformations in bar-beam combination.
11. Experimental and Analytical study of deflections in unsymmetrical bending.
12. Verification of Muller-Breslau principle-Arch / continuous beam / frame models.
13. Verification of Muller-Breslau principle-Begg's deformeter.
14. To find carry over factor for the beam with far end fixed.

**References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Basic Structural Analysis	Reddy, C. S.	Tata McGraw Hill
2. Elementary Structural Analysis	Norris and Wilbur	Tata McGraw Hill

**Geotechnical Engineering lab-II**

**BE/CE-608**

**List of Experiments:**

- 10. Direct Shear Test.**
- 11. Triaxial Test for Different Drainage Condition.**
- 12. Standard Penetration test of Soil.**
- 13. Static Cone Penetration Test.**
- 14. Dynamic Cone Penetration test.**
- 15. Plate load test.**

**References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
Soil Testing and Instrumentation. (Revised Edition),	Alam Singh,	New Age International, New Delhi, 1998.

**Transportation Engineering lab- II**  
**(BE/CE-609)**

**List of Experiments:**

1. Determination of Specific Gravity of bitumen
2. Determination of Ductility of bitumen
3. Determination of Softening point of bitumen
4. Determination of Watercontent of bitumen
5. Determination of Loss on Heating of bitumen

6. Marshal Test,
7. Determination of CBR value (Field)
8. Determination of CBR value (Lab),

**References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
1. Determination of Specific Gravity of bitumen. IS:1202-1978(I)	Bureau of Indian Standards	
2. Determination of Viscosity of bitumen. IS:1206-1978(I)	Bureau of Indian Standards	
3. Determination of Flash Point of bitumen. IS:1209-1978	Bureau of Indian Standards	

**Environmental engineering lab II**  
**(BE/CE-610)**

**List of Experiments:**

1. Determination of B.O.D of sewage
2. Determination of C.O.D of domestic and industrial sewage.
3. Determination of kjeldal nitrogen
4. Determination of volatile, mixed, filterable and dissolved solids.
5. Determination of optimum dose of coagulants.
6. Determination iron and two heavy metals.
7. Determination of SO<sub>2</sub> in the ambient air.
8. Measurement of particulate matter in air.

**References:**

<b>Name of the Books</b>	<b>Author</b>	<b>Publisher</b>
1. Environmental Engineering and Tchobanoglous	Peavy, H.S., Rowe, D.R	McGraw Hill Book Company, 1985.
2. Water and waste water Engineering	fair, G.M., Geyer, J.C and Okun, D.S	fair, G.M., Geyer, J.C and Okun, D.S
3. Water supply and Pollution Control	Viessman, Jr. and Hammer, M.J	Harper Collins College publishers, 1985.
4. Water supply, Waste Disposal and Environmental Pollution Engineering.	A.K. Chatterjee	Khanna Publishers
5. Water supply and sanitary Engineering	S.C. Rangawala, K.S. Rangawala P.S. Rangawala	Charotar publishing housing
6. Water supply and sanitary Engineering	G.S. Birdie & J.S. Birdie	Dhanpat Rai publishing Company,

7. Environmental Engineering	Peavy H.S., Row D.R. and Tchobanoglous G	New Delhi. McGraw Hill Book Company, 1985
8. Sewage Disposal and Air Pollution Control Engineering Environmental Engineering Vol.I	S.K.Garg,	Khanna Publishers, 1979.
9. Water supply and sanitary Engg.	S.C.Rangawala K.S.Rangawala P.S.Rangawala	Charotar publishing House

---

## **SEVENTH SEMESTER**

### **Structural Analysis-III (BE/CE-701)**

#### **FIRST HALF**

Basics of force and displacement matrix method for beams, plane frames (rigid and pin jointed).

Introduction to theory of plate.

Elements of structural dynamics, free and forced vibration of single degree of freedom system, un-damped and damped system.

#### **SECOND HALF**

Response of harmonic, periodic, impulsive and general dynamic loading.

Multi degree of freedom system-concept of shear building and modal analysis of structures.  
Ductility of structures, long & short period structures, concept of response spectrum.

Introduction to Finite element method for frames, trusses and plane stress analysis.

**References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Basic Structural Analysis	Reddy, C. S.	Tata McGraw Hill
2. Indeterminate Structural Analysis	Kinney, J.S.	McGraw Hill Book Company
3. Indeterminate Structural Analysis	Wang, C. K	McGraw Hill Book Company
4. Matrix Analysis of framed Structures	Weaver, W. & Gere, J. M.	CBS Publishers & Distributors, Delhi.
5. Structural Dynamics	Mario Paz	CBS publishers and Distributors
6. Dynamics of Structures	Clough and Penziem	Mc- Graw Hill
7. Dynamics of Structures	A. K. Chopra	
8. The Finite element Method vol.1	Zienkiewicz & Taylor	Mc-Graw Hill
9. An Introduction to the Finite element Method	Reddy, J.N.	Mc-Graw Hill
10. Finite Element Analysis (Theory and Programming)	Krishnamurthy, C. S.	Tata Mc-Graw Hill

**Design of structures-III**  
(BE/CE – 702)

**FIRST HALF**

**Reinforced Concrete structures:**

**Column Footings:**

Isolated and combined column footings.

**Cantilever retaining walls:**

Design of cantilever type of retaining walls.

**Elements of prestressed concrete:**

Analysis of stress concept, concrete tendon placed at an eccentricity, tendon with parabolic profile, load balancing method. Losses of prestress, I.S. specifications analysis and design of prestressed concrete beams – rectangular, I – section, T – section for flexure and shear, Design of end block

## SECOND HALF

### **Continuous and Curved Beams:**

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

### **Shrinkage and Creep:**

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

### **Culverts and bridges:**

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

### **References:**

	<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1.	Limit state Design of reinforced Concrete	P.C Vargheese	P.H.I. Publisher
2.	Limit State Design of R.C.C Structures	A.K. Jain	Nem chand Brothers, Roorkee
3.	Design of Reinforced Concrete Structures	N.Krishnaraju	CBS Publishers
4.	Reinforced Concrete Design	C.K.Wang & C.G. Salman	Harpur International Edition
5.	Reinforced Concrete Design	Mallik and Gupta	Oxford and IBH Publications
6.	Prestressed Concrete	Krishnaraju	Tata Mc Graw Hill New Delhi
7.	Design of R.C.C structures	Ramamurtham	Danpath Rai Publishing Co.
8.	Prestressed Concrete	Dayarathnam	Oxford & IBH Publishing
9.	Essentials of Bridge Engineering	Victor	Oxford& IBH



# Water Resources Engineering –II

(BE/CE – 703)

## FIRST HALF

### Surface Water Hydrology:

**Introduction:** Catchment and its physical characteristics; Hydrologic cycle.

**Precipitation:** Types and forms; measurement of point rainfall; rainfall missing data; Rainguages; average rainfall over an area –different methods; rainfall mass curve, hyetograph, intensity duration curve.

**Evaporation:** Process; evapotranspiration and infiltration; methods of measurement and estimation.

**Run-off:** Run-off components; factors affecting run-off; estimation of run-off.  
stream flow measurement: different direct and indirect methods; stage discharge curve; unsteady flow and backwater effects.

**Hydrographs:** Unit Hydrographs-assumptions; derivation, application and limitations-curve, Synthetic unit hydrograph, distribution graph, instantaneous unit hydrograph.

## SECOND HALF

**Floods:** Rational method, empirical formulae, UH method, flood frequency studies, gumbel's method, Log Pearson Type III distribution, design flood, design storm, risk reliability and safety factor.

**Flood Routing:** Hydrologic routing, hydraulic routing,

### Ground Water Hydrology:

Introduction, aquifers, types of aquifers,

**Ground Water movement-**Darcy's law, hydraulic conductivity and transmissivity

**Well Hydraulics;** Well Losses, specific capacity of well and well efficiency, various types of well, pumping test methods, various construction methods, salt water intrusion, artificial recharge of ground water.

**Reservoir:** Types; physical; characteristics; computation of storage volume; reservoir losses, reservoir sedimentation and control.

### References:

Name of Books

Author

Publisher

1.Engineering Hydrology	K Subramanya	Tata-McGrawHill
1.Applied Hydrology	V.T.Chow	Mc Graw Hill
2.Introduction to Hydrology	W.Viesman, G.L.Lewis,L.W	Kneep,Harper and Row

## **Transportation Engineering-III**

**(BE/CE-704)**

### **FIRST HALF**

**Harbour Engineering:** Role of water transportation, Basic consideration- Ocean Winds, Waves, Tides, Wharf, Pier, Harbour, Port, Layout of Harbour, Port entrance, Construction and operation of Lock gates,  
**Dock:** Wet, dry and floating docks,  
 Break water-different types, dredging,

### **SECOND HALF**

**Airport Engineering:** Role of Air transportation, Airport classification-aerodrome, airfield, airport, Elements of Airport engineering, Airport planning and layout- Site selection, Imaginary surface, Approach surface, Horizontal surface, conical surface, Transitional surface, Terminal Building,  
 Airport Geometric design- Runway, Taxiway, Wind rose, runway orientation, Visual ground aids- Airport lighting, Runway-Taxiway lighting, Runway-Taxiway marking.  
 Airport pavement and design.

#### **References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Harbour, Dock and Tunnel Engineering.	Srinivasan, R	Charotar Publishing House, Anand.
2. Dock and Harbour Engineering.	Oza, H.P.	Charotar Publishing House, Anand.
3. Dock and Harbour Engineering.	Oza, G.H.	Charotar Publishing House, Anand.
4. Airport Engineering,	Bindra, S.P.	Charotar Publishing House,
5. Airport Engineering,	Rangwala,	Charotar Publishing House,
	Bindra, S.P.	Charotar Publishing House,

## **Structural Engg Lab –III** **(BE/CE-706)**

### **List of Experiments:**

1. Compressive, Flexural and tensile strength of Mortar.
2. Initial drying shrinkage, moisture movement, and coefficient of expansion of concrete.
3. Stress strain curve of concrete.
4. Behaviour of under reinforced and over reinforced R.C. beams in flexure.
5. Behaviour of R.C. beams, with and without shear reinforcement in shear.
6. Bond strength between steel bar and concrete (a) in a beam specimen and (b) by pull-out test.

### **References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Concrete Technology	M.S.Shetty	S.Chand & Comp.Ltd
2. Properties of concrete	A.M.Neville	Longman,UK
3. Concrete Structure, properties and materials	P.K.Mehta	Prentice Hall.Inc.USA
4. Concrete technology	M.L.Gambhir	Tata McGraw Hill,New Delhi
5. Polymers in Civil Engg.	J.H.Bungey	Surrey University Press,New York

## **Water Resources Engg Lab.** **(BE/CE-707)**

### **List of Experiments:**

1. Rainfall Measurement
2. Measurement of rate of evaporation
3. Measurement of rate of infiltration of soil.
4. Measurement of velocity of flow in river or stream
5. Delineation of catchment boundary and drainage network to determine the hydrological parameters.
6. Computer Aided (CAD) design in water resources engineering.

### **References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
----------------------	---------------	------------------

1.Engineering Hydrology  
1.Applied Hydrology  
2.Introduction to Hydrology  
3.IRC:SP-13-2004

K Subramanya  
V.T.Chow  
W.Viesman, G.L.Lewis,L.W  
Indian Road Congress

Tata-McGrawHill  
Mc Graw Hill  
Kneep,Harper and Row  
IRC New Delhi,2004

**Elective-II Sessional  
(BE/CE-708)**

Laboratory Experiments based on the Syllabus of respective ELECTIVE – I.

**Project-I  
(BE/CE-709)**

study/review/evaluation/assessment/analysis/design/experimental investigation/software development related to civil engineering problem of interest.

The findings and results are to be presented appropriately in the form of reports/photographic records/drawings/computer printout, presentation in seminar will be encouraged.

**Viva-voce – I.  
(BE/CE-710)**

It is for assessing the candidates overall performances in subject matters related to civil engineering and at the end of semester they will appear before the departmental viva-voce.

**BE/GP – 2 PROFESSIONAL SKILL DEVELOPMENT- I**

- ❖ Filling up of Curricula Vitae.
- ❖ Response to a Job advertisement.
- ❖ Joining Report in a Profession.
- ❖ Report writing on issues related to your profession such as – Improvement of work culture, Improvement of Relationship with your Collogues, submission of a sum-up of annual Report, Maintaining of Environment Friendly atmosphere in the office, Basic amenities requirement to run a good Organization / Office.
- ❖ Basic requirements of Management / Managerial Jobs.
- ❖ Notice Inviting Tenders, Issuance of Supply Orders, Memo, Complaint Letter, Invitation, Notifications etc.
- ❖ Oral Communicative Skill Practice.
- ❖ Mock Interview.

**Departmental Elective–I**  
**A. Geotechnical Engineering**

**Geotechnical Investigation and Practices**  
**(BE/CE – 705/1)**

**Soil Exploration:** Purpose; Method of soil exploration; Boring, sampling; Standard penetration test; Static and dynamic cone test; Correlation between penetration resistance and strength parameters; Plate load test, Stabilization of boreholes.

**Planning of Sub soil Investigation;** Number of bore holes and depth of exploration; Types of tests to suit soil conditions. In situ Method of determination of different soil properties like shear strength, permeability etc. soundings, pressure -meter. Determination of water table under water subsoil exploration.

**Methods of Geophysical Exploration-** Seismic reflection, refraction and electrical resistivity methods.

**Exploration methods in Rocks-** investigation, sequence, drilling, sampling and bore hole inspection.

Laboratory method of determining the various properties and behavior of soils. Dynamic testing of soils.

Method of Geotechnical study for various civil engineering design and construction. Preparation of necessary report. Instrumentation.

**References:**

<b>Sl No</b>	<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1.	<u>Site Investigation</u>	<u>C.R.I. Clayton, M.C. Matthews</u>	<u>Blackwell Science, Oxford.</u>
		<u>and N.E. Simons, (2005).</u>	
2.	<u>Geotechnical Engineering – Soil &amp; Foundation Principles &amp; Practice</u>	<u>Richard L. HandyMerlin G. Spangler</u>	<u>Publ. Jan. 4, 2007.</u>
3.	A Short course in Geotechnical site Investigation	N. E. Simons, Bruce Keith Menzies Marcus Matthews.	
4.	Soil Mechanics in Engineering Practice”.	Karl Terzaghi, Ralph Brazelton Peck, Gholamreza Mesri.	

5. Geotechnical Investigation      Roy E. Hunt.  
 Methods: A Field Guide for  
 Geotechnical Engineers”.

**Rock Engineering**  
**(BE/CE – 705/2)**

Composition of Rocks, Geological classification of rocks, rock structures, Pore space in rock.

Rock coring, Various method of obtaining Rock cores, Engineering classification of Rock masses.

Strength and failure of Rocks. Uni axial strength of Rock Samples, Evaluation of Triaxial strength of Rocks, other shear test on rock sample.

Effect of water on rock strength, Effect of water on rock deformation, flow of water through Rocks.

Structural features of massive rocks ,effect of cracks, faults and folds on engineering behavior of rock masses.

Measurement of stresses in rock masses, various types of stress measuring devices.

Evaluation of properties of rocks in the field, hydraulic fracturing, uses of flat jacks.

Design of structures in rocks, basic design principles of tunnels in rock, design of pressure tunnel in rock, principle of design of rock slopes.

**References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1.    Fundamental of Rock Mechanics.	John Jaeger, N. G. Cook,  and Robert Zimmerman.	--
2.    Introduction to Rock Mechanics.	Richard E. Goodman .	--
3.    An Outline of Soil and Rock Mechanics	Pierre Habib and Bronwen A. Rees.	--
4.    Rock Mechanics and the Design	L. Obert and W.I. Duvall .	--

of Structures in Rock

5. Experimental Rock Mechanics Kiyoo Mogi . --  
(Geomechanics Research)".

**Design of Foundation and Retaining Structure  
(BE/CE – 705/3)**

Foundations on expansive and collapsible soil; under-reamed pile, uplift resistance of piles. Well foundation and its elements; size and depth; forces on well foundation; methods of sinking; scour depth; analysis of well foundation for bearing capacity and lateral stability.

Braced excavation: types of bracing system; stability considerations, heave and uplift computation of earth pressure and strut load. Ground movement. Construction control, Shield Tunneling.

**References:**

Sl No	Name of Books	Author	Publisher
1.	Shallow Foundations: Bearing Capacity and Settlement	Braja.M.Das	McGraw-Hill Publishing Company
2.	Foundation Engineering”, (1 <sup>st</sup> and 2 <sup>nd</sup> Edition)	Peck, Hanson,. Thomas.H. Thornburn	----
3.	Foundation Analysis and Design	Bowles, J.	McGraw-Hill Publishing Company
4.	Analysis and Design of Foundations and Retaining Structures	Shamsher Prakash	----

**Ground Improvement and ground Engineering  
(BE/CE – 705/4)**

Ground improvement principles and techniques. Heavy damping, compaction of piles. Preloading with sand drains/sand wicks. Field control. Principles of stone column, Grouting, Inserting reinforcing elements. Soil dynamics theory of vibration, degrees of freedom, principles of machine foundation design. Dewatering, field pumping test, common dewatering methods. Effects of dewatering.

Application of Geosynthetics, Types of Geosynthetics, Functions, Properties & designing with geosynthetics.

**References:**

Sl No	Name of Books	Author	Publisher
-------	---------------	--------	-----------

1. Guidelines on ground improvement and facilities U. S. Army Corps of Engineers (**Paperback** - Feb 28, 2005),
2. Ground Control and Improvement Petros P. Xanthakos, Lee W. Abramson, and Donald A. Bruce,
3. Reclamation and Ground Improvement Myint-Win Bo and Victor Choa,

**Industrial pollution and control**  
(BE/CE – 705/5)

**A. Water Pollution:-**

**I. General**

Effects of discharge of industrial wastewater on streams, land and environment, Importance and scope. Problems involved in treatment. Variation in quality and quantity of industrial wastewater.

**II. Standards & Criteria**

Indian standards for discharge of treated wastewaters on land, into municipal sewer and natural water courses.

**III. Sampling of Wastewaters**

Representative sample. Grab and composite samples.

**IV. Effluent Quality and Quantity**

Approaches to minimization-good house keeping, equalization and neutralization by mixing of different effluent streams; recycling of wastewater streams. Process modifications in terms of raw materials and chemicals used. Treatment of industrial wastes, Removal of dissolved and suspended solids, organic waste treatment process, sludge treatment and handling.

**V. General Approaches to planning of Industrial Wastewater Treatment and Disposal**

Equalization & proportioning, Neutralization

Treating different effluent streams separately

Treating different streams jointly after mixing them partly or fully

Including/Excluding domestic wastewater along with the industrial waste

Treating industrial wastewaters along with town waste.

**VI. General Approaches for Handling and Treatment of Specific Characteristics of Industrial Wastewaters**

Stream water quality, DO sag curve etc. Approaches for treating wastes having shock loads, colors, toxic metal-ions, refractory substances e.g. ABS and other detergents, growth inhibiting substances such as insecticides, high concentration of nutrients (\*N, P, K etc), oil and grease, suspended solids, BOD. Hot wastes, wastes with acidity, alkalinity, etc.



## **VII. Process Flow Diagrams, Characteristics and Treatment of Various Industrial Wastes**

Industrial wastes of pulp and paper, textile, tannery, food, canning, sugar mill, distillery, dairy, pharmaceutical, electroplating etc.

### **B. Air Pollution:**

Meteorology & atmospheric dispersion. Air pollution due to industrial activities. Control at stationary & mobile sources.

### **References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1 The Treatment of Industrial Wastes	Besseliere, E.B and Schwartz, M	McGraw Hill Kogakusha Ltd., New Delhi, 1969.
2 Industrial Water Pollution, Ann Arbour	Nemerow, N.L.,	
3 Air Pollution	Henry C.	McGraw Hill KogaKusha Ltd., Tokyo, Japan
4 Air Pollution	Stern, Arthur C.	Academic Press, New York, USA, 1977.
5 Wastewater Engineering	Metcalf & Eddy, Inc	Tata McGraw Hill Edition.

## **Environmental Quality & Pollution Monitoring Techniques (BECE – 705/6)**

### **I. General**

Introduction and scope. Ecology and Environment. Recap of Environment: Pollution and control basic principles of management.

Environmental quality a Solid waste management.

### **II. Environmental policies and Legislation**

Rule, act, code, standards, criteria, specification.

### **III. Causes of Environmental Problems**

Nature and scope of environmental problems, population and economic growth, energy growth, human environmental disturbances.

### **IV. Environmental Samples collection and Analysis**

### **V. Fate of Pollutants in the Environment and pollution control Strategies**

Dispersion and diffusion of pollutants in air and water, ground water pollution, leachate and gas movement in landfills, Propagation of noise, various pollution control devices/measures.

### **VI. Hazardous Waste and Risk Analysis**

## **VII. Environmental Impact Assessment**

## **VIII. Sustainable Development**

### **References**

	<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1	Introduction to Environmental Engineering and Science	Masters, G.M.,	Prentice Hall of India Pvt. Ltd
2	Environmental Engineering	Peavy, H.S., Rowe, D.R and Tchobanoglous, G	McGraw Hill company

**Environmental Impact Assessment and Auditing  
(BE/CE – 705/7)**

### **I. Environmental Impact**

Environmental inventories, environmental assessment, evaluation.

### **II. Socioeconomic Impact Assessment**

Financing of capital expenditure, increase in user charges, sociological impacts.

### **III. Role of EIA in Planning and Decision Making Process, Rapid EIA**

Introduction of EIA—Environmental impact statement (EIS) and Environmental impact Analysis (EIA) - meaning and objective of EIA; Environmental Impact prediction –planning and management of Impact studies—ISO 14000 Series—Environmental monitoring and mitigation measures.

### **IV. Environmental Impact Statement**

### **V. Environmental Auditing**

Post audit reviews of EIA, Concept of ISO and ISO 14000

Government standards for Environmental protection. Emerging Global Environmental Issues.

Environmental Legislation.

### **VI. Case-studies**

### **References**

	<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1	Environmental Impact Assessment	Canter , R.L	McGraw Hill Inc.
2	Environmental Impact Analysis Handbook	John G.Rau and David C.Wooten(Ed)	McGraw Hill Book
3	Environmental Impact Assessment, Theory and practice	Peter Wathern(Ed),	Unwin Hyman Ltd., London, 1988
4	Environmental Impact Assessment, Principles and procedures	Munn,R.E.(Ed)	Scope, Unwin brothers Ltd.,

5 Environmental Impact Analysis Jain, R.K., Urban,  
L.V. and Stacay, G.S.

Surrey,  
London, 1979  
Van Nostrand  
Reinhold  
Company, 1977

## **Air pollution and control measures (BE/CE – 705/8)**

### **I. General**

An Environmental problem, Definitions.

### **II. Type of Air Pollutants & Sources**

Particulates, CO, SO<sub>2</sub>, NO<sub>x</sub>, Hydrocarbons etc.

Natural & Man made sources, Emission Factors.

### **III. Air Pollution due to Industries & Automobile Exhausts**

### **IV. Meteorology**

Wind profiles, Turbulent diffusion, wind roses, Topographical effects, Inversions, Plume behaviour, plume rise, stable and unstable conditions.

### **V. Plume Dispersion**

Gaussian model, Diffusion coefficients, Inversion effects, Limits to the models.

### **VI. Particulates**

Terminology, Size distribution, Removal mechanisms, particulate collection devices, choice of equipments, standards.

### **VII. Sulphur Oxides**

SO<sub>x</sub> sources, Ambient concentrations, Test methods, Control techniques, Standards, Costs, Ambient downwind concentrations.

### **VIII. Nitrogen Oxides**

Sources, Ambient concentrations, Test methods, Thermodynamics & kinetics of nitrogen oxides, Control techniques, Standards of performance, costs.

### **IX. Effects of Air Pollution**

Plant damage, corrosion, Art treasures, human health-respiratory system, special diseases, Episodes.

### **X. Air Quality & Emission Standards**

Criteria & Standards, U.S and Indian Standards, Pollution control laws.

### **XI. Global Effects of Air-Pollution**

Green house effect, Acid rain, Ozone layer disruption etc.

## References

	<b>Name of Books</b>	<b>Author</b>	<b>Publisher/Paper</b>
1	Air Pollution	Henry C	McGraw Hill Kogakusha Ltd. Tokyo, Japan,1974
2	Air Pollution	Stern, Arthur C.	Academic Press, New York, USA,1977.
3.	Water supply and sanitary Engineering	G.S.Birdie&J.S. Birdie.	Dhanpat Rai publishing Company, New Delhi
4.	Sewage Treatment & Disposal and Wastewater Engineering.	Dr.P.N.Modi	Standard Book House.
5	Water supply, Waste Disposal and Environmental Pollution Engineering i/c Air pollution and control	A.K.Chatterjee.	Khanna Publishers.

## **Rural water supply and sanitation (BE/CE – 705/9)**

### **I. General**

Concept and scope of Environmental sanitation in rural areas, magnitude and problems of water supply and sanitation in rural areas in India, National Policy.

### **II. Water Supply**

Quality aspects: specific impurities and their significance, Design population, Demand and variations, Planning of water supply schemes in rural areas: individual village and group schemes, Sources of water supply: springs, wells, infiltration wells, radial wells, infiltration galleries and surface water intake, Treatment of water for rural water supply, compact system: multi bottom settler, slow sand filter, diatomaceous earth filter, cloth filter, chlorine diffusion cartridges, pumps, pipe, materials, appurtenances and improvised device for use in rural water supply schemes, Distribution systems for rural water supply.

### **III. Disposal of Night soil and wastewater**

Various methods of collection and disposal of night soil: Sanitary latrines, community latrines, septic tanks, soakage system, anaerobic filter, Imhoff tank, Compact and simple wastewater treatment units: Stabilization ponds, revolving biological surface.

### **IV. Biogas Plants**

Quantity of cow dung, Required capacity and design.

### **V. Disposal of Solid Wastes**

Composting, land filling, Incineration.

References

<b>Name of Books</b>	<b>Author</b>	<b>Publisher/Paper</b>
1. Water supply for Rural areas and small communities	Wagner, E.G and Lanoix, J.N	WHO Monograph series No. 42,1959
2. Rural Water Supply and Sanitation	Wright, F.B.,	--
3. Excreta Disposal for Rural Areas and Small Communities”	Wagner, E.G., and Lanoix, J.N	W HO Monograph, W series No. 39,1977

## **EIGHTH SEMESTER**

### **Design of structures-IV (BE/CE – 801)**

#### **FIRST HALF**

#### **Reinforced Concrete Structures: Multistoried Building Frames**

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

Determination of Earthquake Forces (IS: 1893 (part-I)-2002; seismic coefficient method; response spectrum method); seismic design and detailing of RC buildings

#### **Water tanks and Towers**

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

### **Bunker & Silo**

Design of silos, bunkers and their supporting structures.

### **Steel Structure:**

#### **Moment resistant Connections**

Connections for frames, brackets.

Determination of Earthquake Forces (IS: 1893) (Part-I)-2002; seismic coefficient method; response spectrum method); seismic design and detailing of steel buildings

## **SECOND HALF**

### **Industrial Buildings**

Loads, General arrangement and stability considerations, Design of purlins, roof trusses, industrial building frames, gantry girder and bracings.

### **Bridge**

Plate girder and truss bridges, general arrangement, Design of bridges for highway / railway loading , Design of truss bridge for railway loading.

### **Plastic methods**

Analysis and design of beams and frames.

### **References:**

	<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1.	Limit state Design of Reinforced Concrete	P.C Vargheese	P.H.I. Publisher
2.	Limit State Design of R.C.C Structures	A.K. Jain	Nem chand Brothers, Roorkee
3.	Design of Reinforced Concrete Structures	N.Krishnaraju	CBS Publishers
4.	Reinforced Concrete Design	C.K.Wang & C.G. Salman	Harpur International Edition
5.	Reinforced Concrete Design	Mallik and Gupta	Oxford and IBH Publications
6.	Design of Steel Structures Vol –I, II	Ramchandra	Standard book House Delhi

7.	Design of Steel Structures	L.S.Negi	Tata Mc Graw Hill
8.	Design of steel structures	A.S Arya & J.L.Azmani	Nem chand Brothers Roorkee
9.	Prestressed Concrete	Krishnaraju	Tata Mc Graw Hill New Delhi
10.	Design of R.C.C structures	Ramamurtham	Danpath Rai Publishing Co.
11.	Prestressed Concrete	Dayarathnam	Oxford & IBH Publishing

### **Project Planning and Management (BE/CE-802)**

#### **FIRST HALF**

**Project:** Project conception, Feasibility study, Cost benefit Analysis, Project appraisal.

**Planning:** Staff, Labour, Materials, Logistics.

**Management:** Network method, Resource management-materials/men/machines/money.  
Project cost control.

**Contacts:** General condition, types/bias. Special condition, Specifications, Measurement,  
Payment types/conditions.

**Tendering:** Pre-qualification criteria, Tender documents, Tender evaluation, Tender  
negotiation, Tender pricing strategies.  
Construction Finance, Financial planning, Costing, Time and cost over runs, Claims &  
Settlement. Insurance

#### **SECOND HALF**

**Personnel:** Personnel management, Staff & Labour welfare, Public relation.

**Quality control:** Organizing construction, Inspection and quality control.

**Safety:** Site safety measures, Accident prevention, First Aid.

**Laws:** Labour law; Arbitration

**References:**

<b>Name of Books</b>	<b>Author</b>	<b>Publisher</b>
1. Project Planning and Control With PERT And CPM	Dr. B.C. Punmia K. K. Khandelwal	Laxmi Publications(P) Ltd. New Delhi
2. PERT and CPM Principles and Applications	L.S. Srinath	Affiliated East -West Press Pvt. Ltd. New Delhi
3. Project Management with PERT and CPM	Dr. D.S. Hira	S.K. Kataria & Sons New Delhi
4. A Management Guide to PERT/ CPM With GERT/PDM/DCPM And other Network.	Jerome D. Wiest Ferdinand K. Levy	Prentice Hall of India Pvt. Ltd. New Delhi
5. Construction Planning and Management	P.S. Gahlot B.M. Dhir	New Age International (P) Ltd. New Delhi

## **Design of Hydraulic Structures**

(BE/CE – 803)

### **FIRST HALF**

**Dams:** Investigation Survey, Selection of dam Site, Selection of type of dam, Classification and field exploration.

**Earth and Rockfill Dam:** Causes of failures and remedial measure, selection of earth dam, Design considerations, Phreatic lines, Seepage loss through earth dams, Stability analysis, Control of seepage through earth dams, Rockfill dams.

**Gravity Dams:** Forces acting on gravity dam; modes of failures; load combination for design, elementary profile, stability analysis; control of cracking; Galleries.



**Spillway:** Spillway and energy dissipation below spill way.

## SECOND HALF

**Diversion Head works:** Selection of site and lay-out; Components of diversion head works; Design of barrage and weirs.

**Cross Drainage Structures:** Types of cross drainage structures, design of cross drainage structures, Water way and headway of the stream, Head loss through cross drainage structures, Design of transitions for canal waterway, uplift pressure on trough, Uplift pressure on culvert floor.

**Hydraulics of Small bridges and culverts:** Essential design data: empirical and rational formulae for peak run-off from catchment; estimation of flood discharge; Design discharge; Alluvial streams and lecey's equations; Linear Water way; calculation of scour depth; Elements of hydraulics of flow through small bridges and culverts; Hydraulic details of Pipe culverts, R.C. box culverts and slab culverts.

**River Training Works:** Types of river training works, Methods, Bank protection works, Spurs, Guide Banks, Artificial cutoff.

### References:

Name of Books	Author	Publisher
1.Irrigation and water Resources and Water Power Engineering	P.N.Modi	Standard Book House
2.Irrigation Engineering and Hydraulic Structures	S.K.Garg	Khanna Publishers
3. Irrigation Engineering and Hydraulic Structures	R.K.Sharma	Oxford & IBH Publication

## Geotechnical Engineering –III (BE/CE – 804)

### FIRST HALF

#### 1. Foundations

Common types of foundations with examples; Brief illustration of situations where each one of them is adopted; Basis for design; Review of major soil parameters used in proportioning of foundations.

#### 2. Shallow Foundations

Types and their selection; Terminology

Bearing capacity-Terzaghi's equation; Terzaghi's Bearing Capacity theory, Types of shear failure; Computation of bearing capacity in cohesion less and cohesive soils; Effect

of various factors on Bearing Capacity; Bearing Capacity from Standard Penetration Tests; Eccentrically loaded Foundations;  
 Settlement: Components of settlement; Limits of settlement; Accuracy in Foundation Settlement Prediction; Allowable Settlement; Allowable Soil Pressure; Plate Load Test; Estimation of settlement of footings and rafts on sands Penetration and Plate load test data; Estimation of settlement of footing/ rafts on cohesive soils using consolidation test data; Correction for rigidity and 3D consolidation effect; Proportioning of footings.

### 3. **Pile Foundations**

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

## **SECOND HALF**

### 4. **Well Foundations**

Situations where adopted; Elements of wells; Types; Methods of construction; Tilt and shift; Remedial measures.

Proportioning- Depth and size of wells on the basis of scour depth, bearing capacity and settlement; Terzaghi's lateral stability analysis.

### 5. **Introduction to Machine Foundation**

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

### 6. **Foundation on Expansive Soil**

Identification of expansive soil, Problems associated with expansive soil; Design consideration of foundation on expansive soil; Under-reamed piles.

<b>Name of Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Basic and Applied Soil Mechanics	Gopal Ranjan and Rao, A.S.R	New Age International, New Delhi, 1998
2. Soil Mechanics in Engineering Practice	Terzaghi, K, and Peck, R.B	John Wiley, New York, 1968.
3. Soil Mechanics and Foundation Engineering	Arora, K.R.,	Standard Publishers Distributors, New Delhi-110006.

**Structural Engg Lab-IV**  
**(BE/CE – 806)**

**List of Experiments:**

1. Behaviour of pre-stressed concrete beams in flexure.
2. Ultimate strength and deflection of R.C.C. slab.
3. High strength concrete using admixtures.
4. Non destructive testing of concrete.

**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Concrete Technology	M.S.Shetty	S.Chand & Comp.Ltd
2. Propertis of concrete	A.M.Neville	Longman,UK
3. Concrete Structure, properties and materials	P.K.Mehta	Prentice Hall.Inc.USA
4. Concrete technology	M.L.Gambhir	Tata McGraw Hill,New Delhi
5. Polymers in Civil Engg.	J.H.Bungey	Surrey University Press,New York

**Civil Engineering Estimation & Costing**  
**(BE/CE – 807)**

Sessional works based on complete design, cost analysis and estimation of followings:

- 1.Buildings (Masonry and R.C.C constructions)
- 2.Roads.
- 3.Bridges.
- 4.Cross drainage structures.
- 5.Water Tanks.
- 6.Urban Drainage systems

**ELECTIVE –II SESSIONAL**  
**(BE/CE – 808)**

Laboratory Experiments based on the Syllabus of respective ELECTIVE - II

**Project: II**  
**(BE/CE – 809)**

The Project-II/Thesis work will involve in-depth study/review/evaluation/assessment/analysis/design/experimental investigation/software development related to civil engineering problems of interest. The findings and results are to be presented appropriately in the form of reports/photographic records/drawings/computer printout and presentation in seminar will be encouraged.

**Viva-voce – II**  
**(BE/CE – 810)**

It is for assessing the candidates overall performances in subject matters related to civil engineering and their ability. Each student has to appear before the departmental viva-voce.

**BE/GP-3 PROFESSIONAL SKILL DEVELOPMENT- II**

- ❖ Group Discussion
- ❖ SEMINERS (Power Point Presentation)
- ❖ Extempore Speech Practice
- ❖ Details of Future Profession of the Student Concerned – to be prepared / presented in the practice shop.
- ❖ General aptitude Test.

**Elective–II**

**A. Structural Engineering**

**Advanced Structural Analysis**  
**(BE/CE-805/1)**

**Elements of Elasticity-** displacement, strain, stress, elastic constants, equilibrium, strain compatibility, Airy's stress function.

Moment distribution for space frames. Matrix methods for Frame and grid analysis.

Plate Equation in Cartesian and polar co-ordinates. Analysis of circular plates with or without central holes.

Membrane analysis and design of spherical and cylindrical shells. Cylindrical shell with bending.

**Dynamics of structures** – a seismic design of building Frames- Model analysis.

**Design of special structures-** water tanks, transmission towers, steel stacks, reinforced concrete chimneys for temperature stresses, bridge super structures etc.

**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1.Matrix Analysis of Framed Structures	W. Weaver & J.M.Gere	CBS. McGraw Hill.
2.Theory of Elastic Stability	S.P. Timoshenko & J.M. Gere	McGraw Hill.
3.Mechanics of Materials	E.J. Hearn, Butter Worth	Hanemann
4.Matrix Method of Structural Analysis	R.K. Livesley.	Pergamon Press, The Macmillan

**Advanced Structural Design  
(BE/CE-805/2)**

Yield line analysis of slabs: work and equilibrium methods. Design and analysis of statically determinate pre-stressed concrete. Structures for flexure and shear. Introduction to analysis of indeterminate pre- stressed beams and frames.

Brittle fracture and fatigue. Plastic design of steel structures. Bracing systems, pre stressed steel construction. Design of composite steel and concrete structural members. Design provisions using cold – formed steel.

**Laboratory Experiments:-**

**Concrete:** Properties and testing of fresh and harden concrete, Concrete mix design, non-destructive testing of concrete.

**Reinforced Concrete:** Testing of under reinforced and over reinforced beams

**Steel:** Strength, fracture and micro structural characteristics of mild and cold worked steels, welded and non-welded testing of tabular and angle section.

**Stress analysis :** Two dimensional photo elasticity.

**References:**

Name of the Books	Authors	Publishers
1. Reinforced Concrete structural elements	P. Purushotham.	Tata McGraw Hill.
2. Reinforced Concrete Design	R. Park and T. Pauly	John willy & sons.
3. Design of Prestressed Concrete	A.H. Nilson.	John willy & sons
4. Reinforced Concrete Designer's Hand book	Chas E Reynold Grosvenons's	Cement Concrete association 52 Garden, London SW1
5. Design of Steel structures	P. Dayaratnam	Wheelers
6. Design of Steel structures	E.H. Gaylord, C,N.Gaylord and J.E.Stellmeyer	McGraw Hill
7. Steel Structures	R.Englekirk	Wiley

8. Composite steel & Concrete  
Structural members

D.J. Oehlers, M.A. Bradford

Pergamon

### **Bridge Engineering** ( BE/CE-805/3)

**Classification of bridges**, Components of bridges. Bridge site investigations, selection of bridge site. Hydraulic design, Loading standard, temporary bridges- movable bridges. Design discharge. Linear water way . Economical span and type. Sub soil explorations.

Standard specification for road and railway bridges. Design loadings and different forces to be considered.

**General design considerations**. Traffic aspects of highway bridges. Approaches. Aesthetics of bridge design.

Different type of reinforced concrete, pre stressed concrete and steel bridges. Large – span bridges.

Sub structure and foundation details. General design principles of piers, Abutments, Piles and well foundations.

Bearings, joints and hand rails.

Construction techniques and maintenance. Bridge distress.

#### **References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Bridge Engineering.	S. Ponnuswamy.	Tata McGraw Hill
2. Concrete Bridges: Inspection, repair, Strengthening, testing and load capacity evaluation	Raina.	Tata McGraw Hill

3. Concrete Bridge Practice:

Analysis, design and economics

Raina. .

Tata McGraw Hill

**Experimental Stress Analysis  
(BE/CE-805/4)**

Introduction to strain measurement, electrical resistance strain gauges, strain gauge circuits, photo elasticity, optics of photo elasticity, photo elastic effect, Isoclinics and Isochromatics, Determination of fringe constant, Method of stress separation, Frozen stress method, Moire Technique, Holography, Photo elastic coating and brittle coating.

**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Experimental Stress Analysis.	J .W. Dally and W.F. Riley	McGraw Hill
2. Hand Book of Experimental Stress Analysis.	M. Hetenyi	Eastern economy
3. Experimental Stress Analysis and. motion measurement	P.H.Adam & R.C.Dove	Eastern economy.

**Introduction to Finite Element  
(BE/CE-805/5)**

Basic Concepts of engineering analysis, Principles of Structural mechanics, Method of weighted residuals and variational formulations. Finite element method, displacement model, shape function, elements properties, Iso-parametric elements, assemblage of elements. Analysis of plane stress/ strain, axi- symmetric solids. Three dimensional stress analysis, plate and shell element, solution technique. Finite element programming, use of package programs.

**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
--------------------------	----------------	-------------------

- |                              |                                    |                     |
|------------------------------|------------------------------------|---------------------|
| 1. The Finite Element Method | O.C. Zienkiewicz & R. L. Taylors . | McGraw<br>Hill      |
| 2. Finite Element Analysis   | C.G.Krishnamoorthy                 | Tata McGraw<br>Hill |

## **B. Water Resources Engineering**

### **Water Resources Planning and Management (BE/CE-805/6)**

**Full Marks: 100**

**Contact Periods: 04(3L+1T)**

Water Resources Planning and Management

#### **Introduction**

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

#### **Planning:**

Water resources planning process; Planning for single purpose and multipurpose projects, estimation of different water needs and project formulations, comparison of alternatives. cost-benefit analysis

Introduction to optimization techniques and system approach.

#### **Management**

Evaluation and monitoring of water quantity and quality, managing water distribution networks for irrigation , flood control and power generation, inter basin transfer of water, conjunctive use of surface and ground water, water quantity and quality modeling, evaluation of impacts of water Resources projects on river regimes and environ ment, reservoir sedimentations and water shed management.

#### **Reference**

- | <b>Name of Books</b>                                    | <b>Authors</b>                 | <b>Publishers</b>                                 |
|---|--------------------------------|---|
| 1. Principle of water Resources Planning                | Good man, A.S                  | Prentice Hall,<br>Inc.,Engle wood Cliffs,N.J.1984 |
| 2. Water Resources Engineering, 3 <sup>rd</sup> edition | Linsley, R.K/and Frazini,J.B., | Mc.Graw hill,<br>New York,1979.                   |

### **River Engineering and Flood Control (CE-805/7)**

River regions and their characteristics, Classifications of rivers on alluvial plains,Meandering, sediment transport, River Training works, Morphometry, flood, runoff estimation, Statistical methods, flood routing, Modified Puls method, Muskingum Methods, numerical methods, flood forecasting and warning.



**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Irrigation and water power Engineering	B.C.Punmia	Standard Publishers 1992
2. Irrigation and Hydraulic Structures	-S.K.Garg	Khanna Publishers,1992.

**Advanced Hydrology  
(CE-805/8)**

Precipitation, Circulation, Temperature, humidity, wind formation, precipitation data, analysis, water losses evaporation, infiltration, Transpiration ,Runoff, Factors affecting runoff, Hydrograph analysis, Unit hydrograph, Synthetic unit hydrograph, Applications, Basic mathematical Models and flood routing.

**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Applied Hydrology	V.T.Chow	Mc Graw Hill
2. Introduction to Hydrology	W.Viesman, G.L.Lewis,L.W	Kneep,Harper and Row,1989

**Computational hydraulics  
(BE/CE-805/9)****I. Introduction**

Basic equations of fluid motion, heat and mass transfer, need for their numerical solution.

**II. Solution Techniques**

Classification of governing equation – parabolic, elliptic and hyperbolic type, method of characteristics, explicit and implicit finite difference schemes- Crank Nicholson, Pence man- Richford ADI, Leaf from, Lax – Wend off, successive over- relaxation methods, consistency, convergence and stability of the schemes.

**III. Type of problems**

Analysis of water distribution networks, hydraulic transients in closed conducts, flood routing in stream using Saint- Venant equations, numerical solutions for one – dimensional convection and diffusion equation.

**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Computational Hydraulics	Brebbia, C.A. and Freeante , A.J.	Burrerworth& Company ( Publishers) Ltd., London, 1983

2. Applied Hydraulics Transients Chaudhary, M.H.,

VanNostrand  
Reinhold company, Inc.,  
New York, 1987.

3. Unsteady Flow in Open Channels Mahmood, K. and Yeyjevich, V

Water  
Resources  
Publications,  
Fort Collins, Colorado,  
U.S.A, 1975.

## **Remote Sensing and applications of GIS**

**(BE/CE-805/10)**

### **I. Remote Sensing**

Introduction and definition of Remote Sensing terminology, Photogrammetry, Types of Photographs, Geometry of photographs, Stereophotogrammetry.

Remote Sensing- stages and sources, electromagnetic radiation and spectrum, spectral signature, atmospheric window, Characteristics of different type sensors, images and platforms, Orbital parameters of a satellite.

### **II. Interpretation of Images:**

Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth collection and verification advantages of multitemporal and multiband images.

### **III. Digital Satellite Data**

Digital satellite data products and their characteristics. Histogram and its utility, Enhancement, Different methods of digital satellite data interpretation.

### **IV. Application of Remote Sensing**

Application in water resources management, river morphology, runoff estimation and forecast, snow surveys, flood zoning and damage estimation, land use mapping and monitoring, environmental studies, urban pollution, atmospheric pollution studies, environmental, soil science and highway planning, engineering and regional planning, natural resources surveys, cartographic applications.

### **V. Basic Concept of GIS**

Introduction- Information systems, spatial and non- spatial information, Geographical concepts and terminology, Advantages of GIS. Basic component of GIS, Commercially available GIS hardware and software, organization of data in GIS.

## **VI. GIS Data**

Input data- Field data, Statistical data, Maps, Aerial photographs, Satellite data, points, lines and areas features, Vector and Raster data, Advantages and disadvantages, Data entry through keyboard, digitizers and scanners, Digital data. Preprocessing of data- Rectification and registration, Interpolation techniques.

## **VII. Data Management**

Data Management- Data base Management System( DBMS), Various data models, Run- length encoding, Quadrees, Data Analysis – Data layers, analysis of spatial and non- spatial data, data overlay and modeling. Data Presentation- Hard copy devices, Soft copy devices.

## **VIII. Application of GIS:**

Application of GIS in Map Revision, Land use, Agriculture, Forrestry, Archaeology, Municipal, Geology water Resources, Soil Erosion, Land suitability analysis, change detection.

### **References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
1. Introduction to Remote Sensing	Campbell, J.B	TheGuilford Press, London, 1986.
2. Principles of Remote sensing”	Curran, P.J.,	Longman , London,
3.Remote Sensing in Hydrology	Engman, E.T. and Gurney, R.J.,	Champman and Hall, London, 1991.
4. Element of Photogrammetry	Wolf, P.R.,	McGraw Hill Book Company, New Delhi, !986.

## **C. Transportation Engineering**

### **Pavement Engineering (BE/CE-805/11)**

**Pavement Materials:** Types of Pavement Materials and their evaluation, Bitumen, Tar, Cutbacks and emulsion.

**Structural Design of Pavement:** Design Factors, Equivalent single wheel load, Repetition of loads, Pavement Structure-soil interaction, strength of pavement component materials,

**Flexible Pavements:** Methods of Bituminous mix Design, Pavement Design, Layered system analysis and Design.

**Rigid Pavement:** Load and temperature stress, Analysis and design, Design of joints and load transfer devices, Joints, Fillers and sealers.

**Construction Techniques and specifications:** Quality control test for Highway construction, Construction equipments and specifications for stabilized and bituminous roads, Bituminous surface treatment, Penetration macadam, Bituminous bound macadam and bituminous concrete, Mastic asphalt, sheet asphalt, Construction equipments and specifications for cement concrete roads.

**Reference:**

<b>Book</b>	<b>Author</b>	<b>Publisher</b>
1. Pavement Analysis and Design,	Yang H. Hung,	Prentice-Hall
2. Design and Performance of Road Pavements,	David Croney	McGraw Hill,
3. Guide for Design of Pavement Structures- I & II	AASHTO	AASHTO

**Traffic Engineering and Management**  
**(BE/CE-805/12)**

Highway traffic Characteristics, Traffic parameters and inter relationship, traffic volume, speed, density, capacity,

Traffic studies- Volume speed, OD.

Traffic operation and management- Traffic congestion, circulation, Planning, control devices, management improvement measures,

Speed change Lane- Different type of speed change lane, Design of speed change lane,

Street lighting, Level of services,

Parking- On street parking, parallel parking and angle parking, Off street parking, Advantages and Disadvantages of on street and off street parking,

Accident- Spot map, Collision Map, Condition diagram,

Different lane system- One way lane and reversible lane, Advantages and Disadvantages of one way lane and reversible lane,

Traffic signal- Different type of traffic signal, Design of traffic signal,

Rotary intersection- Advantages and disadvantages of rotary intersection, Design of rotary intersection ( four legged).

**References:**

<b>Book</b>	<b>Author</b>	<b>Publishers</b>
1. Introduction To traffic Engg.: A manual for data collection & analysis,	Thomas R. Currin	Brooks
2. Traffic Engineering and Transport Planning,	Kadyali, L.R.,	Khanna Publisher,
3. Traffic Engineering,	Roger P Roess, Elena S Prassas,	Prentice Hall,
4. Traffic Engineering Design principle & Practice,	Mike Slinn, Poter Guest, Paul Matthews,	Elsevier,

**Hill Roads  
(BE/CE-805/13)**

Introduction: Importance of hill roads, problems specific to hill road construction; geometric design, alignment survey, Geometry of hill roads, geometric standards; construction: formation cutting, protective structures, cross drainage works; maintenance: drainage, land slides, snow clearance, Curve layout in hill Road,

**References:**

<b>Name of the Books</b>	<b>Authors</b>	<b>Publishers</b>
Hill Road Mannual	IRC-SP:48-1998	Indian Road Congress

**Urban Transport Planning**

**(BE/CE-805/14)**Urban Transportation Planning Process, Urban Travel and Transportation Systems Characteristics,

Function and form of urban structures, services, classification of urban centres, growth patterns,

Travel Demands Forecasting- trip generation, trip distribution, modal split and trip assignment, urban transport problems,

Transport Behavior of Individuals and House holds,

Land use/ Transportation systems, land value and congestion, access and business migration,

Introduction to Urban Freight Transportation and Urban Mass Transportation Systems.

Characteristics of buses, bicycle, para transit, rapid transit,

Traffic Restraint Techniques and methods.

**Reference:**

<b>Book</b>	<b>Author</b>	<b>Publisher</b>
1. Traffic Engg.and Transport	Kadiyali, L.R	Khanna Publishers.

**Introduction to Town Planning  
(BE/CE-805/15)**

Definitions of town planning and urban design, basic planning studies, levels of planning and steps for preparation of a town plan, survey techniques in planning and urban design, concepts, functions, components and preparation of a development plan.

The role of the planner in directing and monitoring urban and regional development.

Planning concepts related to garden city, satellite towns and ribbon development. Introduction to analytical techniques in Town Planning and Urban Design.

Concepts in Regional and Metropolitan planning, land subdivision regulations and zoning, urban design principles and criteria, nature of urban design regulations and control, the comprehensive role of urban design in town planning process.

**Reference:**

<b>Book</b>	<b>Author</b>	<b>Publisher</b>
1. Town and Country Planning and Housing	N.V. Modak and V.N. Ambdekar	Orient Longman Ltd.